MONTHLY WEATHER REVIEW.

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INTRODUCTION.

The MONTHLY WEATHER REVIEW for June, 1903, is based on data from about 3300 stations, classified as follows:

Weather Bureau stations, regular, telegraph and mail, 160; West Indian Service, cable and mail, 8; River and Flood service, 52, river and rainfall, 177, rainfall only, 62; voluntary observers, domestic and foreign, 2565; total Weather Bureau Service, 2962; Canadian Meteorological Service, by telegraph and mail, 20, by mail only, 13; Meteorological Service of the Azores, by cable, 2; Meteorological Office, London, by cable, 8; Mexican Telegraph Company, by cable, 3; Army Post Hospital reports, 18; United States Life-Saving Service, 9; Southern Pacific Company, 96; Hawaiian Meteorological Service, 75; Jamaica Weather Service, 130; Costa Rican Meteorological Service, 25; The New Panama Canal Company, 5; Central Meteorological Observatory of Mexico, 20 station summaries, also printed daily bulletins and charts, based on simultaneous observations at about 40 stations; Mexican Federal Telegraph Service, printed daily charts, based on about 30 stations.

Special acknowledgment is made of the hearty cooperation of Prof. R. F. Stupart, Director of the Meteorological Service of the Dominion of Canada; Mr. Curtis J. Lyons, Territorial Meteorologist, Honolulu, H. I.; Señor Manuel E. Pastrana, Director of the Central Meteorological and Magnetic Observatory of Mexico; Camilo A. Gonzales, Director-General of Mexican Telegraphs; Capt. S. I. Kimball, Superintendent of the United States Life-Saving Service; Lieut. Commander W. H. H. Southerland, Hydrographer, United States Navy; H. Pittier, Director of the Physico-Geographic Institute, San José, Costa Rica; Commandant Francisco S. Chaves, Director of the Meteorological Service of the Azores, Ponta Delgada, St. Michaels, Azores; W. M. Shaw, Esq., Secretary, Meteorological Office, London; Rev. Josef Algué, S. J., Director, Philippine Weather Service; and H. H. Cousins, Chemist, in charge of the Jamaica Weather Office.

Attention is called to the fact that the clocks and self-registers at regular Weather Bureau stations are all set to seventy-fifth meridian or eastern standard time, which is exactly five hours behind Greenwich time; as far as practicable, only this standard of time is used in the text of the REVIEW, since all Weather Bureau observations are required to be taken and recorded by it. The standards used by the public in the United States and Canada and by the voluntary observers are believed to conform generally to the modern international system of standard meridians, one hour apart, beginning with Greenwich. The Hawaiian standard meridian is 157° 30′, or $10^h\ 30^m$ west of Greenwich. The Costa Rican standard of time is that of San José, $0^h\ 36^m\ 13^s$ slower than seventy-fifth meridian time, corresponding to $5^h\ 36^m$ west of Greenwich. Records of miscellaneous phenomena that are reported occasionally in other standards of time by voluntary observers or newspaper correspondents are sometimes corrected to agree with the eastern standard; otherwise, the local standard is mentioned.

Barometric pressures, whether "station pressures" or "sea-level pressures," are now reduced to standard gravity, so that they express pressure in a standard system of absolute measures.

FORECASTS AND WARNINGS.

By Prof. E. B. GARRIOTT, in charge of Forecast Division.

The month of June, 1903, had a remarkable record for loss of life and property by flood and storms throughout the United States.

In the lower Missouri and upper Mississippi rivers lives were lost and property to the value of millions of dollars was destroyed by floods that were second in magnitude only to the floods of June, 1844.

At St. Louis, Mo., the Mississippi River passed the danger line, 30 feet, on the 2d, and reached a stage of 38 feet on the 10th. The various stages at that point were accurately forecast for from two to four days in advance.

A full description of the floods referred to, the damage they caused, and the action taken by the Weather Bureau in issuing warnings in connection therewith, will be found under the heading "Rivers and floods."

During the early days of the month heavy rains caused freshets in the east Gulf and South Atlantic States, and at points in Arkansas the Arkansas River was from 1 to 2 feet above the danger line. In the north Pacific coast States high temperatures and a great amount of snow in the mountains furnished conditions favorable for rises in the Columbia River and tributaries.

On the 6th Pacolet, Clifton, and Glendale, S. C., were devastated by floods due to heavy rains in the mountainous watersheds of the streams of that district. Many lives were lost in and about the places named, and the property loss has been estimated at about $3,000,000. During the 7th and 8th the James River, Virginia, rose rapidly. On the 12th flood conditions were reported in the Delaware River at Port Jervis, N. Y., and in the Raritan Valley, New Jersey.

On the 14th torrential rains in a range of hills south of Heppner, Oreg., caused a rush of water down the bed of Willow Creek, in which the town is located, drowning about 200 persons and destroying property to the estimated value of $250,000.

High water, due to melting snow in the upper headwaters of the Rio Grande River and heavy rain in northern New Mexico, was reported in the Rio Grande River, in New Mexico, and western Texas on the 14th and 15th. On the 18th the Rio Grande reached a maximum stage at San Marcial, N. Mex., where the water was several feet deep in the lower portion of the town.

On the 28th and 29th heavy rains fell in localities in the Middle Atlantic States.

A period of rainy weather that set in on the 7th and continued intermittently during the balance of the month broke a drought that had prevailed in the Middle Atlantic and New England States for nearly two months, and extinguished destructive forest fires that were raging in the Catskills, Adirondacks, and White mountains.

On the 1st a tornadic storm struck Gainesville, Ga., killing or fatally injuring more than 100 persons, and destroying property to the value of about $500,000.

A period of warm weather set in over California, Nevada, and the north Pacific coast States on the 5th and continued until the 8th, with maximum temperatures above 100° in the central valleys of California on the 6th, 7th, and 8th, and maximum temperatures ranging from 95° to 97° in western Oregon and western Washington on the 7th and 8th.

Frost was reported in the western parts of North Dakota and South Dakota on the 10th, in parts of Minnesota, South Dakota, Nebraska, western Kansas, and northern Iowa on the 11th, and in Michigan and parts of Wisconsin and Iowa on the 12th.

In the south of England the middle part of the month was wet and unseasonably cold, while in the north of England the country was suffering from drought.

On the North Atlantic Ocean and on the coasts and Great Lakes of the United States the storms of the month were not severe.

BOSTON FORECAST DISTRICT.

The month was characterized by much cloudiness, uniformly low temperature, excessive rainfall, and an unusual prevalence of easterly winds and fog. Storm warnings were displayed on the 12th, 13th, 15th, 16th, 20th, 22d, and 23d. No storms or dangerous winds occurred for which warnings were not issued.—*J. W. Smith, District Forecaster.*

NEW ORLEANS FORECAST DISTRICT.

The month was unseasonably cool, and at New Orleans it was the coolest June on record. No severe storms occurred on the west Gulf coast. To supply demands for information regarding the effect, in the lower Mississippi Valley, of the high water in the upper Mississippi and lower Missouri rivers during the early part of the month, the following statement was issued on the 11th:

> The Mississippi, below Vicksburg, and the Atchafalaya, will rise slowly for three weeks and possibly longer, and the danger line, 16 feet, will probably be reached at New Orleans within ten days or two weeks.

The river rose slowly from 13.6 feet on June 11 to 15.4 feet on July 2, 1903.—*I. W. Cline, District Forecaster.*

CHICAGO FORECAST DISTRICT.

There was no storm of consequence on the upper Lakes during the month, and no warnings were issued.

Unusually cool weather prevailed over the districts until near the end of the month.—*H. J. Cox, Professor of Meteorology.*

DENVER FORECAST DISTRICT.

The feature of the month was the copious precipitation that occurred on the southeastern watersheds during the first two weeks.

High stages were reached in the Arkansas River, principally as a result of the heavy rainfall on the drainage areas of its southern tributaries, while in the case of the Rio Grande the usually high stages were due to the melting of snow on its upper watersheds in Colorado, in conjunction with continued rainfall in northern New Mexico, which was forecast from day to day during the period.—*J. H. Brandenburg, District Forecaster.*

SAN FRANCISCO FORECAST DISTRICT.

On the 3d the temperature began to rise in northern California and on the 4th in Nevada; developing into a warm wave on the 5th, which continued over Nevada until the 8th and northern California until the 9th. Temperatures exceeding 100° were general in the great valleys of California on the 6th, 7th, and 8th. On the coast exceptionally high temperatures for the season occurred on the 6th.—*G. H. Willson, Local Forecaster, temporarily in charge.*

PORTLAND, OREG., FORECAST DISTRICT.

During the afternoon of June 14 a severe thunderstorm, with heavy rain and hail, occurred near the foot of the Blue Mountains in the southern part of Morrow County, Oregon. Owing to the nonabsorbant condition of the soil and the steepness of the catchment area, this rain quickly collected in the canyon near the head of Willow Creek and formed a flood which swept down the valley and wrought great destruction. The town of Heppner, near the starting point of the rushing waters, suffered the loss of nearly 200 of its inhabitants and, as near as can be estimated, property damaged to the extent of $250,000. At the beginning the flood crest was coincident with the first appearance of the flood, but as the water advanced and spread over a large area the crest lagged several hours behind the beginning of the rise. The annual rise in the Columbia River made its appearance later than usual, and the danger line at Portland was not reached until the evening of the 3d. Daily forecasts of expected heights in the river were issued during the month for periods of a week in advance; they proved to be very accurate, and in the precautions that were taken rendered the damage to property by flood very light.—*E. A. Beals, District Forecaster.*

AREAS OF HIGH AND LOW PRESSURE.

Movements of centers of areas of high and low pressure.

Number.	First observed.			Last observed.			Path.		Average velocity.	
	Date.	Lat. N.	Long. W.	Date.	Lat. N.	Long. W.	Length.	Duration.	Daily.	Hourly.
High areas.		°	°		°	°	*Miles.*	*Days.*	*Miles.*	*Miles.*
I	3, p. m.	41	124	5, a. m.	47	117	1,025	1.5	683	28.4
II	8, a. m.	54	114	14, a. m.	35	90	2,450	6.0	408	17.0
III	15, a. m.	53	108	19, a. m.	47	65	3,000	4.0	750	31.2
IV	19, p. m.	41	124	22, a. m.	42	101	1,700	2.5	680	28.3
Sums							8,175	14.0	2,521	104.9
Mean of 4 paths							2,044		630	26.2
Mean of 14.0 days									584	24.3
Low areas.										
I	1, a. m.	40	122	2, p. m.	41	112	775	1.5	517	21.5
II	6, p. m.	50	97	9, p. m.	46	78	1,000	3.0	333	13.9
III	8, p. m.	32	91	16, a. m.	32	65	3,250	7.5	433	18.0
IV	12, p. m.	41	117	16, p. m.	45	80	2,225	4.0	556	23.2
V	16, p. m.	51	120	21, p. m.	42	70	3,000	5.0	600	25.0
VI	21, p. m.	47	92	23, a. m.	46	78	1,400	1.5	933	38.9
VII	21, p. m.	32	100	24, a. m.	39	78	2,200	2.5	880	36.7
VIII	24, p. m.	32	100	26, p. m.	36	87	875	2.0	438	18.3
IX	24, p. m.	51	120	28, p. m.	49	86	2,500	4.0	625	26.0
Sums							17,225	31.0	5,315	221.5
Mean of 9 paths							1.914		591	24.6
Mean of 31.0 days									556	23.2

For graphic presentation of the movements of these highs and lows see Charts I and II.—*George E. Hunt, Chief Clerk, Forecast Division.*

RIVERS AND FLOODS.

The mean stages of the Missouri and Mississippi rivers were above those of the preceding month principally on account of the great flood in the lower Missouri and upper Mississippi

rivers that began during the last week of May. The upper Missouri was also higher but not decidedly so, the rise being the annual one due to snow water from the mountainous portion of the upper watershed.

In the flood districts the stages of the water were the highest in nearly sixty years and at some places on the Mississppi River the highest ever recorded. At Kansas City, Mo., the crest stage on June 1 and 2 was 35 feet, 2 feet below the great high-water mark on June 20, 1844. At St. Louis the maximum stage was 38 feet, 0.5 foot above the flood mark of May 19, 1858, and 3.4 feet below the extreme highest water of June 27, 1844. At Hannibal, Mo., the highest stage was 22.5 feet, 0.5 foot above the previous high-water mark of June 7, 1851. At Keokuk the crest stage of 19.5 feet was 1.5 feet below the previous record stage of June 6, 1851. The volume of the flood was sufficient to increase the stage at Cairo to within 1.5 feet of the danger line of 45 feet, while from below Cairo to Arkansas City, Ark., danger lines were slightly exceeded. As stated in the WEATHER REVIEW for May, 1903, the detailed description of these floods will appear at a later date.

Nothing of special interest occurred along the Ohio River or its tributaries.

Heavy showers during the night of June 6 over the middle and eastern portions of the James River watershed caused a rapid run-off on the 7th, resulting in a stage of 14.7 feet at Richmond, Va., on the morning of the 8th, 2.7 feet above the danger line. The usual warnings were issued on the 7th and notification given to prepare for a 15-foot stage: 14.7 feet was the stage actually reached. Some low corn, wheat, and meadow lands were submerged, but all portable property, principally along the steamboat wharfs and docks, was saved.

The South Carolina rivers were also high at the same time as a result of heavy showers, and warnings were issued from the 6th to 8th, inclusive. The stages of water in the main streams were not extreme except at Columbia, S. C., where the maximum stage was 27.2 feet, 12.2 feet above the danger line. The warnings were timely and no reports of damage along the main rivers have been received.

The heavy showers of the 4th and 5th in Georgia caused a rapid rise over all watersheds, necessitating warnings of a moderate freshet in the Ocmulgee River on the 5th and 6th. The warnings were of great value to live stock and lumber interests in the swamps and lowlands along the river. At Macon, Ga., where the maximum river stage was 19 feet, one foot above the danger line, dwellers in the bottoms were forced to temporarily vacate their homes. Many of the lowland farms were overflowed and the crops thereon ruined or greatly damaged. Reports received from those directly interested indicate that property to the value of not less than $100,000 was saved by the flood warnings.

Flood waters in the upper Rio Grande also did considerable damage to the farm lands in New Mexico. A detailed report, by Mr. L. H. Murdoch, Section Director, Galveston, Tex., follows further on.

The Columbia River rise continued until the 20th, when its crest reached the Pacific Ocean. It will be remembered that in March the official in charge of the United States Weather Bureau office, Portland, Oreg., issued a bulletin in which he stated that, from the amount of snow apparently in the mountains, a stage of 24 feet of water might be expected at Portland by June 15. This stage is 9 feet above the danger line. On June 18 only 3 days after the time indicated, a stage of exactly 24 feet was recorded. The water continued at 24 feet until the 19th when the decline began. Daily bulletins and forecasts were issued, beginning about May 19, and continued until the waters had subsided. The forecasts and warnings were of great benefit to the agricultural and commercial interests, and a large number of commendatory letters relative thereto have been received.

The history of the unfortunate and disastrous casualties at Pacolet, S. C., and Heppner, Oreg., is familiar to all. A large number of lives was lost, especially at Heppner, where the swift torrent from the mountains engulfed many of the fleeing inhabitants ere they could reach places of safety. The damage to property amounted to at least $7,000,000, of which over one-half was done along the Pacolet River from Clinton to Pacolet, S. C. The effects of these floods were also felt in a lesser degree across the whole northern tier of counties in the State of South Carolina.

These disasters were evidently the results of extreme intensifications of a class of disturbances that at times visit all localities. They can be neither anticipated nor prevented, but it would seem that these terrible experiences should serve as an effectual warning to others who are tempted by convenience of location or other minor advantages to establish communities in narrow valleys, below deep gorges, whose constricted outlets are of barely sufficient capacity to carry away any water much above the normal flow. Similar disasters are possible at any time where the local topography corresponds, and no false sense of security should be assumed from the fact that nothing unusual had happened during the past.

The highest and lowest water, mean stage, and monthly range at 160 river stations are given in Table VII. Hydrographs for typical points on seven principal rivers are shown on Chart V. The stations selected for charting are Keokuk, St. Louis, Memphis, Vicksburg, and New Orleans, on the Mississippi; Cincinnati and Cairo, on the Ohio; Nashville, on the Cumberland; Johnsonville, on the Tennessee; Kansas City, on the Missouri; Little Rock on the Arkansas; and Shreveport, on the Red.—*H. C. Frankenfield, Forecast Official.*

Mr. L. N. Jesunofsky, Local Forecaster at Charleston, S. C., submits the following report:

FLOODS IN SOUTH CAROLINA.

Unprecedented heavy rainfall over the extreme northwestern portion of South Carolina, on the Broad River watershed, during the afternoon and night of June 5 and early morning of June 6, produced severe floods in the small streams of that section and wrought great destruction of property and an appalling loss of life. The following excessive precipitation was reported at 8 a. m. June 6: Spartanburg, 5.04 inches; Greenville, 3.82 inches; Gaffney, 3.64 inches. The rainfall at Gaffney was almost continuous from 12:30 p. m., June 4, to 6 p. m., June 6, and amounted to 4.68 inches during that period.

The area flooded by precipitation of 3.50 to 5.00 inches during the twenty-four hours ending June 6, covered the whole of Cherokee, Spartanburg, Greenville, and the eastern half of Pickens counties, bordering on the Blue Ridge, Saluda Mountain range. Judging by the damage resulting from the run-off, fully two-thirds passed through the tributaries of the upper and central Broad, the Tiger, the Pacolet, and the Enoree rivers. The volume of water that passed through the Saluda caused but little damage at Columbia at the confluence of the Saluda, Broad, and Congaree, as compared to that produced by the abnormal flow of the Tiger, the Pacolet, and the Enoree passing through the Broad and emptying into the Congaree at Columbia.

At the 8 a. m. observation of the 6th the gage at Columbia showed a reading of 7.4 feet, which was a fall of 2.0 feet for the twenty-four hours previous. The stream began to rise rapidly at about 1 p. m. of the 6th, and by 8 a. m. of the 7th it had risen 12.0 feet to a gage height of 19.3 feet, or 4.3 above the point of danger. The water rose at the rate of 0.6 of a foot per hour between 8 a. m. and 12 noon to a height of 21.6 feet. At 6 p. m. the gage read 25.0 feet, rising at the rate 0.7 of a foot per hour; at 10 p. m., 26.0 feet, rising at the rate of 0.3 of a foot per hour. The crest of the flood waters passed Columbia at 1 a. m. of the 8th, at a maximum stage of 27.2 feet, or 12.2 feet above the danger point. There was a rapid decline late on the 8th and on the 9th, 10th, and 11th. The Congaree was at and above the danger line from 11 p. m. of the 6th to 7 a. m. of the 10th. During the 8th and 9th drift was running heavily, including parts of houses and some bales of cotton.

Although not so excessive as that recorded over the drainage section of the Broad, the area of 1.50 inches to 2.00 inches of precipitation extended beyond Cherokee County, on the upper Broad, throughout York County, and thence into Gaston, Mecklenburg, and Union counties, N. C., late on June 5 and the morning of the 6th. This run-off caused a rise of 13.0 feet at Camden, on the Wateree, during the 6th and 7th, to a gage reading of 28.3 feet at 8 a. m. of the 8th, or 4.3 feet above the line of danger. The waters receded slowly during the 9th, 10th, and 11th, when another supply fed this stream, causing it to rise 6.0 feet during

the night of the 11–12th. There was rapid recedence during the 13th and 14th. The Wateree, at Camden, reached the danger line at about 2 a. m. of the 7th, and fell below it at 7:30 a. m. of the 9th. The flood crest passed Camden at 3 a. m. of the 8th, at a stage of about 29.4 feet.

Moderately heavy rainfall, measuring from 1.00 inch to 1.25 inches over the upper drainage basin of the Great Pedee, between Cheraw, S. C., and Salisbury, N. C., produced a rise of 17.4 feet at Cheraw, on the Great Pedee, during the 7th, 8th, and 9th. The greatest height attained by this moderate freshet was 21.2 feet, or within 6.0 feet of the danger point.

The combined drainage from the Broad, Congaree, and Wateree rivers had emptied into the Santee River, and overflowing its banks, had spread over the wide expanse of low and level swamp lands for many miles into Orangeburg, Clarendon, Berkeley, and Williamsburg counties, thereby lessening the danger somewhat from additional rises of great magnitude. The Santee River, at St. Stephens, commenced to rise slowly on the 8th, an effect produced wholly by the rainfall in the immediate vicinity of the stream, and not from run-off from the Congaree or Wateree rivers. There was a rise of 0.4 of a foot per day only during the 9th, 10th, and 11th; a rapid rise of 4.7 feet during the 12th and 13th, and a slow rise of 0.8 of a foot on the 14th. Notwithstanding the large area of swamp lands covered by some 4 to 5 feet of water, for many miles on each side of the stream along the coastal lowlands, the Santee, at St. Stephens, continued to rise slowly until 1 p. m. of the 15th, when the gage registered 15.2 feet, or 3.2 feet above the danger point. The flood waters reached the line of danger, 12.0 feet, at about 2 a. m. of the 13th, and fell below it at about 4 a. m. of the 19th. The rate of fall per day was exceedingly small during the 16th and 17th, and rapid on the 18th, 19th, and 20th. The last of the large volume of reddish-yellow freshet waters entered the Atlantic about the 22d of June, or fifteen days after its run-off on the upper catchment basins, and discolored the waters of the ocean for many miles, both northward and southward, between Beaufort and Georgetown.

There were 628 telegraphic and postal flood warning messages sent out from Charleston station during June 6, 7, and 8, and forecasts were highly successful.

The region of apparent greatest precipitation in the Piedmont district of South Carolina was drained by the Pacolet, the Tiger, and the Enoree rivers, small tributaries of the Broad. The Pacolet River flows east of Spartanburg and west of Gaffney. Between these two towns the main line of the Southern Railway crosses the Pacolet, at Clifton, upon a high steel structure set on massive granite piers 45 feet in height. An idea of the extent and great force of the floods may be gained when it is stated that the bridge was erected to withstand any onslaught from the elements, but was swept down by the tremendous rush of waters as if it were only a pile of sand. There is a decided elevation between Columbia and the towns bordering on the Piedmont Gap, which makes the rate of fall, per mile, in waters of the Broad and its tributaries, unusually great. The elevation of Columbia is 351 feet above mean sea level; that of Spartanburg, 875 feet; Greenville, 989 feet; and Gaffney, 893 feet.

Fourteen miles below Clifton, from Spartanburg to Columbia, is the cluster of Pacolet cotton mills. To the west of the Pacolet River is the South Tiger River, with cotton mills distributed at intervals along its banks. East of Greers, the main line of the Southern Railway crosses the Tiger on an iron bridge which was crushed in a mass of ruins.

Untold loss of life, the complete annihilation of Clifton mill No. 3, and Pacolet mills Nos. 1 and 2, the injury done to thousands of bales of cotton and newly manufactured goods; 3500 operatives suddenly thrown out of employment; the complete loss of grist and flour mills, livery stables, post-offices, dwellings, stores, churches, and much live stock sum up the work of the floods that occurred between Clifton and Pacolet, on the Pacolet River, a rather small tributary of the Broad, from 5:30 to 6:30 a. m. on Saturday June 6, 1903. So quickly did the river rise that the country surrounding it was covered by 40 feet or more of water within almost an hour's time. Timber, cotton goods, baled domestics, sheetings, broken machinery, and floating dwellings came down from the wreckage. The débris which struck the dam above the mill property was unable to break it, and all of this came with terrific impetus against Pacolet mill No. 1 and tore it to pieces. The destruction of Pacolet mill No. 2, but a short distance downstream, followed in quick succession. The newest mill, No. 3, was saved from complete destruction by the breaking of the huge dam. The mills at Pacolet were located on the west bank of the Pacolet, below the surface of the country and directly next the river. Normally, the stream at that point scarcely reaches a height of over 6 feet, but on that day the waters rose about the dam to a height of over 50 feet. Fortunately the majority of the operatives' houses are located on the hills nearby, or the death list would have been far greater than that reported, 50.

The wreck at Clifton mills was probably the most disastrous in the course of the floods. The mill, erected in 1899, was completely wrecked and washed away. This mill was the first on the Pacolet River, where the site is lower than the surrounding country. On each side are high cliffs, and the water was said to have risen to the amazing height of 60 feet. For several hours the mill stood the damaging effect of the waters but gradually gave way, piece by piece, heavy timbers being thrown high into the air, for some time threatening the destruction of the trestle at Converse Station. Above the mill site is the remnant of the dam which urnished power for all three of the Clifton mills. On one side of the dam there is piled up, in a confused mass, the remains of the power house; below this are the remains of mill No. 3. On the opposite side of the river can be seen a bare hillside. On this spot there were 15 cottages, occupied by mill operatives. Now there is only one wrecked house to be seen. The first great rise of the river occurred at about 5:30 a. m. Many of the operatives were preparing for their work and these were saved from horrible deaths by fleeing to the nearby hills; but many women and children were washed away and drowned before any alarm could be given.

The damage to the mills in the flooded section, according to the latest advices, is about as follows: Pacolet mills Nos. 1 and 2, on the Pacolet River, completely swept away. Clifton mills Nos. 1 and 2 partly destroyed. Clifton mill No. 3 a total loss, except pickers and cloth room; four warehouses gone; dam swept away. The Converse mill, at Glendale, is an entire loss. The Dexter mill was partly destroyed. Pacolet mill No. 3 sustained partial injury. The warehouses attached to Pacolet mills Nos. 1, 2, and 3, with approximately 3500 bales of cotton and 4500 bales of cloth, were carried before the rush of waters; much was recovered along the stream. The Whitney mill, north of Spartanburg, was badly damaged by water. White's mill, Tuckapau mill, Fairmount mill, Arkwright mill, Arlington mill, and the Courtenay mill were considerably injured by the flood waters. The Valley Falls mill, at Lolo, the Inman mill, at Inman, the Newry mill, at Seneca, and the Lockhart mill, on the Broad River, withstood the floods. Most of the mills that escaped the flood suffered more or less damage to machinery on the lower floors and to stock from flooding by water.

The dam at Pacolet was nearly washed away by a tremendous downpour some three years ago.

The Saluda runs between the counties of Greenville and Anderson, between Greenville and Pickens, and between the large mills in the towns of Pelzer and Piedmont, which, fortunately, escaped complete flooding. The flooded area extended along the entire Piedmont section from the borders of Cherokee County to the eastern boundary of Georgia.

Seeking its way to the Savannah River was the immense volume of overflow that came from the Toxaway dam, that there forms a lake nearly 10 miles long and a mile wide. Some of this water was carried down the Keowee and Seneca rivers, inundating the Newry mill, at Pelzer, and the Norris mill, at Cateechee. It destroyed the high railroad bridge over the Seneca, running between Seneca and Anderson, and caused the temporary suspension of the Anderson Water, Light, and Power Company's plant, located at Portman Shoals, 10 miles west of Anderson Court House, a small tributary of the upper Savannah, which supplies water and electricity to the town of Anderson, as well as a temporary suspension of the cotton mills at that point.

A tremendous landslide occurred at Tyron, N. C., at the foot of Saluda Mountain, on the Southern Railway tracks, between Spartanburg and Asheville, at about noon of the 12th, due to the excessive rainfalls over that locality but a few days previous. Thousands of tons of rocks and dirt plunged downward, completely filling in one of the largest railroad cuts in the mountains of western North Carolina and effectually shutting off all traffic for twelve days. The roadmaster had just succeeded in resuming operations of trains, which were blocked by the washouts in Spartanburg County the latter part of the previous week. It is stated that another crack has been noticed in the mountain, just in the rear of the cliff from which the avalanche descended.

The amount of damage done to railroad, telephone, and telegraph companies is enormous. Bridges, trestles, telegraph and telephone wires were swept away by the fury of the floods. Spartanburg was almost entirely cut off from communication during the night of the 6th, 7th, and a portion of the 8th. Traffic was blocked in all directions.

The total loss at Glendale, Clifton, Pacolet, and other points, based upon conservative estimates, obtained from the daily press and other reliable sources, is placed at $4,500,000. The list of the dead and missing is 61; upward of eight bodies were not recovered. All crops along the Broad, Pacolet, Tiger, Enoree, Saluda, Congaree, lower Wateree, and the upper Santee were lost entirely. The rice plantations along the lower Santee withstood the floods quite well.

Mr. L. H. Murdoch, Section Director at Galveston, Tex., submits the following report:

JUNE FLOODS IN THE RIO GRANDE.

During the ten days ending June 14, 1903, precipitation occurred almost daily over the headwaters of the Rio Grande. The total fall was between 3 and 4 inches and this, with the usual amount of water from melting snow, produced quite a marked flood in the upper portion of the river.

At Rio Grande, N. Mex., the highest station from which records were secured, the water gradually rose from a level of 9.0 feet the first of the month to the maximum level of 13.6 feet on the 14th and 15th. The crest of this flood reached San Marcial, N. Mex., on the 18th and recorded a level of 12.7 feet, being a rise of 3.9 feet since the first of the month. The high water passed El Paso, Tex., between the 19th and 21st. The gage reading at that place was 14.1 feet, showing a rise of 5.1 feet since the early part of the month. High water reached Fort Hancock, Tex., on the 26th, and recorded the reading of 13.3 feet, or a

total rise of 5.8 feet for the flood. Below Fort Hancock the progress of the flood, which had its origin in the headwaters of the river, was marked by a flood in the lower portion which began about the same time.

From June 9 to 13 about 4 inches of rain fell over the watershed of the Rio Grande below El Paso. In the vicinity of Fort McIntosh the very heavy fall of about 8 inches occurred.

At Langtry, Tex., the river rose 6.1 feet on the 11th and 12th, reaching the stage of 9.0 feet. The crest of this flood reached Eagle Pass, Tex., on the 14th, where the total rise from the beginning of the rainfall was 11.1 feet and the gage reading 13.8 feet. The very heavy rainfall which occurred in the vicinity of Fort McIntosh masked the rise which was coming down the river from above that point, the highest stage at Fort McIntosh being reached on the 14th, as at Langtry. The high water reached Carrizo, Tex., on the 15th. The total rise from the 12th to 14th being about 14.5 feet. The flood passed Roma, Tex., on the 16th and recorded a level of 19.5 feet, or total a rise of 15.4 feet between the 12th and 16th. High water was reached at Fort Ringgold, Tex., on the 19th, the total rise amounting to about 15 feet. The river overflowed above Brownsville, Tex., on the evening of the 15th and then remained at about the same level until the 24th. The total rise was 13.0, or about half a foot higher than any level reached during the past twenty years.

Most of the damage resulting from the flood occurred in the vicinity of Berino, N. Mex., and was due to the giving away of the head gates of the San Jose irrigating ditch. Farms and buildings were flooded, causing damage to the extent of about $15,000. Near Fort Ringgold several slight changes in the channel of the river are reported. For about thirty miles above Brownsville traffic was interfered with for a few days on account of the overflowed bottoms.

No regular flood forecasts are issued for the Rio Grande, but the appearance of a marked rise at a station is wired to all points on the river below that station by the local observer. On June 13 Mr. H. O. Rawlins, the river observer at Eagle Pass, notified all places below his station that an 8-foot rise had occurred at Eagle Pass. This information undoubtedly resulted in a considerable saving of stock and other property.

CLIMATE AND CROP SERVICE.

By Mr. JAMES BERRY, Chief of Climate and Crop Service Divison.

The following summaries relating to the general weather and crop conditions during June are furnished by the directors of the respective sections of the Climate and Crop Service of the Weather Bureau; they are based upon voluntary reports from meteorological observers and crop correspondents, of whom there are about 3000 and 14,000, respectively:

Alabama.—Corn and minor crops made satisfactory progress, and are generally promising. Cotton retarded by cool nights, but, while small, was improving at close of month, when squares were becoming general and some blooms were forming.—*F. P. Chaffee.*

Arizona.—There were quite good rains over a large part of Arizona during the latter half of the first and the first half of the second decade of June, but during the rest of the month the weather was dry. Moderate temperatures prevailed most of the month, but the latter part was very warm. As a rule crops did well during the month, having been revived by the showers and the increased flow of irrigation water. There was some damage later by dry weather. Range feed was plentiful and stock did well.—*M. E. Blystone.*

Arkansas.—The month was cool with less than the normal rainfall. Considerable progress was made in cleaning fields of weeds and crops were generally clean. Cotton made slow progress, but by the end of the month the plant, while small, was healthy, the stand fair and was beginning to take on forms. Corn made a slow, steady growth; at the close of the month nearly all had been laid by; it was tasseling well, and the stalk, while small, was healthy. Harvesting of wheat and oats progressed under favorable weather conditions; the yields were light. Early potatoes were harvested and good yields of excellent quality were secured. Apples will be a short crop of inferior quality.—*Edward B. Richards.*

California.—Conditions were generally favorable for crops, with the exception of deficient rainfall. Fires caused considerable damage to standing grain in the Sacramento Valley, and deciduous fruits in some sections were slightly injured by heat. Grain harvest commenced in nearly all sections before the 15th, and haying was progressing. Heavy crops of grain and hay were being harvested in southern California, and fair crops in other sections. Deciduous fruits, grapes, and oranges were in good condition.—*G. H. Willson.*

Colorado.—The small amount of sunshine on the eastern slope and the general lack of seasonable warmth were unfavorable to rapid growth, but this was largely compensated by copious and well distributed precipitation. Small grain and potatoes, as a rule, made excellent progress; corn grew slowly, owing to cool weather; beets made good advance; gardens, fruits, and cantaloupes did well. About one-half of the alfalfa crop was in stack at the close of month; ranges improved rapidly and afforded excellent pasturage; prospects were good for a fine crop of native hay.—*F. H. Brandenburg.*

Florida.—The month was cooler than the average, with a moderate deficiency in precipitation. Cotton made slow growth the first half of month, advancing favorably the latter half, although the staple was about two weeks late; fruiting was quite general. The corn crop is good. Cane, sweet potatoes, pineapples, citrus fruits, and minor crops doing well.—*A. J. Mitchell.*

Georgia.—A cool, wet month, the coolest June in twelve years, and with one exception the wettest. The night temperatures were unseasonably low, particularly on the 13th, when very light frost formed in a few northern localities. Excessive rains occurred in numerous sections, while in a few counties the rainfall was considerably deficient. The general conditions were unfavorable to agriculture. Crops made slow growth and were poorly cultivated. Cotton was generally small and sickly; blooming began much later than usual. Minor crops have promise of yielding satisfactorily.—*J. B. Marbury.*

Idaho.—Though no extremely high temperatures were recorded during the month many of the nights were unusually warm, and the mean temperature was, with one exception, higher than that of any June in the past eleven years. Over the northern counties precipitation was ample for needs of vegetation and crops made unusually rapid growth; elsewhere water for irrigation has been abundant and irrigated crops have made satisfactory advance.—*S. M. Blandford.*

Illinois.—The weather conditions, particularly temperature, were unfavorable for crop advance throughout the month. It was too cool for growth, and the corn crop at the end of the month was very uneven, being about two weeks backward. The fields were clean and the crop in a good state of cultivation. Oats were short and uneven. The hay crop was promising, clover being exceptionally heavy. Great destruction to corn and wheat ensued from inundation in counties bordering on the Mississippi. It was estimated that over 500,000 acres under cultivation were ruined. The wheat crop was very much below the average.—*Wm. G. Burns.*

Indiana.—Excessive moisture during first decade delayed farm work, and low temperature until last three days of month retarded crop growth. Corn planting finished after the 15th, three weeks late at end of month. Wheat and clover harvest under way last half of month, clover heavy, wheat light. Oats uneven, suffering from rust, and unpromising. Prospect for potatoes fairly good. Apples promised less than average crop, and other tree fruit light to fair. Tomatoes, melons, gardens, cucumbers, and tobacco in fairly good condition.—*W. T. Blythe.*

Iowa.—Cool and dry weather was favorable for wheat and oats, checking tendency to rust and rank growth, but corn needed more warmth and sufficient rainfall to prevent encrusting the surface. Good progress was made, however, in planting, replanting, and cultivating corn, and warmer weather in closing decade brought the crop forward in better condition than was deemed possible at the outset. Hay harvest began early with good prospects. Apple crop better than in recent years.—*John R. Sage.*

Kansas.—Cool, dry month. Wheat harvest began in extreme south during second week, extending to central during fourth week. Corn improved as cultivation progressed and temperature rose. Cutting first crop of alfalfa began first week and second crop last week. Grass fine. Apples in good condition south, poor north. Potatoes good crop, doing well outside flooded district.—*T. B. Jennings.*

Kentucky.—The month was exceptionally cool, the temperature averaging lower than ever previously recorded for June in this section. Light frosts were reported in some localities on the 12th and 13th, causing a little damage to tender vegetation. The rainfall was about normal and fairly well distributed. The cool weather was unfavorable to corn and it made very slow growth during the month. The setting of tobacco was about completed during the first half of the month, and it started off fairly well. Oats and rye did fairly well. Irish potatoes and gardens showed good advance. The harvesting of wheat was generally completed during the last week, and a light crop was reported. The cool weather was favorable to apples and there was less complaint of dropping than usual.—*H. B. Hersey,*

Louisiana.—There was not sufficient rainfall during the early part of the month for agricultural interests, but general and sufficient showers occurred toward the close of the month. Unseasonably low temperatures prevailed during the greater part of the month and retarded the growth and development of vegetation. Cotton made very little progress until toward the close of the month and the crop is generally two to three weeks later than usual. Careful and systematic cultivation caused stubble and fall plant cane to hold their own, but spring plant suffered serious injury in some sections as a result of the cool, dry weather. Rice is promising. Corn made slow but healthy growth. Oat harvest was completed under favorable conditions. Truck gardens promise a good yield.—*I. M. Cline.*

Maryland and Delaware.—Abundant moisture favored grasses, but hindered cultivation and harvest, while low temperatures checked growth in corn. Wheat harvest progressed, giving light yields, but returns from barley and rye were fair to good; oats improved in the upper counties

although affected with rust; some hay was cut with local loss by showers; tobacco was grassy but grew well. Apples continued promising. Truck prospered, although lack of sufficient sunshine caused small crops to mature slowly.—*Edward C. Easton.*

Michigan.—June was generally quite cool for best crop growth. The early part of the month was especially dry in the northern counties and Upper Peninsula; ample showers during latter half greatly improved all vegetation. Wheat, rye, early potatoes, sugar beets, peas, and barley made good progress. Old meadows were rather thin and short. Oats, garden truck, and corn were slow, corn especially backward. Haying began last week of month. Apple prospects continue promising.—*C. F. Schneider.*

Minnesota.—Dry weather continued in the Red River Valley, except for a few light showers, till the rains of the 29th and 30th. Crops on fall plowed lands withstood the drought fairly well, but wheat, oats, barley, and flax on spring plowed land were in great danger at end of month. Frequent heavy rains in southern portions flooded lowlands and kept level lands wet. Rye and clover in bloom and winter wheat and timothy heading early in month. Haying began about the middle of the month. Early barley heading and rye ripening about the 25th.—*T. S. Outram.*

Mississippi.—The mean temperature was the lowest on record for June. Cotton made very slow growth and at the close of the month was small, uneven, and about three weeks late, but generally well cultivated and healthy. Corn did remarkably well; the early was laid by in fine condition. The planting of peas for forage was general. Sugar cane, sorghum, and melons were promising. Vegetable crops yielded well.—*W. S. Belden.*

Missouri.—The month was unseasonably cool, it being the coolest June of which there is any record in this State. The low temperature was unfavorable for corn and cotton and those crops were backward, but after the first week were generally well cultivated. Practically all crops on the Missouri and Mississippi bottoms were destroyed by floods, but replanting was in progress during the latter part of the month. Wheat harvest progressed favorably, but the yield was generally light. Oats were damaged somewhat by rust and lice, but promised fair to good yields, except in some southern counties. Meadows made a heavy growth. Apples continued to decline.—*A. E. Hackett.*

Montana.—Cool nights and an insufficiency of sunshine made growth of all crops rather slow. The precipitation, however, was very favorable for all vegetation; the monthly amount was below the normal, but showers were gentle and frequent and all of the moisture was absorbed by the ground. Grain is in fair to good condition, but late. The alfalfa crop is good and generally ready to be harvested. Hay and ranges made great improvement toward the last of the month, but the hay crop will be below the average. Potatoes are good and fruit prospects are very good.—*Montrose W. Hayes.*

Nebraska.—Rain and the wet condition of the soil early in the month retarded farm work. Corn planting and the cultivation of the early planted corn progressed rapidly in the second week and this work continued throughout the month, a little corn being planted the last week in June. The low temperature of June, the late planting of much of the crop, and the retarding of cultivation by wet weather resulted in corn being unusually small and weedy at the close of the month. The month was very favorable for the growth of grass, and pastures were in fine condition, while the hay crop promises to be very large. Wheat and oats generally grew well, although some rust appeared in nearly all fields, but not sufficiently to do much damage. Potatoes continue in fine condition.—*G. A. Loveland.*

Nevada.—The weather throughout the month was very favorable for the growing crops and for harvesting hay and grain. Frost on the morning of the 3d damaged garden truck slightly in a few localities. Irrigation water was quite plentiful in all districts, and crops of all kinds made rapid growth. Live stock improved in condition, the range feed and pasturage being fine and abundant in all sections. Fruit prospects the best in years.—*J. H. Smith.*

New England.—The weather for the month was marked by an unusual amount of cloudiness, temperature decidedly below normal, and quite uniform and excessive rainfall. The average temperature for the district, 59.5°, is the lowest for June of record, and the average rainfal, 6.71 inches, the largest for June. The weather conditions were very unfavorable for all crops. Frosts occurred in interior and northern sections and resulted in considerable damage in some localities. The month closed with several days of favorable weather. All crops backward, and excepting grass, at a standstill.—*J. W. Smith.*

New Jersey.—The chief characteristics of the month were the abnormally low temperature, excessive and uneven distribution of rainfall, and the very dense smoke that prevailed throughout the State on the 4th, 5th, and 6th. It was so dense that it obscured the sun and caused considerable irritation of the eyes. Cultivation and planting were delayed in the central and northern sections, the ground being too wet to work.—*Edward W. McGann.*

New Mexico.—Almost daily rains during first two decades over northern portion, but in extreme southwest not greatly above normal. Accompanying cold weather retarded crop growth, especially corn, and following closely on the lambing season killed many lambs and ewes. But the rains changed the aspect of the spring season from one of drought to one of excellent prospects for stock and crops.—*R. M. Hardinge.*

New York.—The temperature was decidedly below normal, and drought continued until the 7th. After the 10th the ground was too wet for cultivation, and corn, potatoes, and beans were poor and very backward June 30, but a marked improvement in wheat, rye, barley, oats, pastures, and meadows immediately followed abundant rains. Grapes continued promising, but other fruit generally light, except apples, which varied from light to heavy. Farm work much delayed.—*R. G. Allen.*

North Carolina.—The month was very unfavorable for the growth of most crops on account of the unusually low temperatures that prevailed; with the exception of June, 1878, only, the month was the coldest on record. Frosts occurred in the mountain district on the 13th and 14th. The month was also very wet, farm work was interrupted, and crops became rather grassy. Cotton made very little growth and was very small at the close. Corn improved considerably. Tobacco and all minor crops did fairly well. Harvesting winter wheat, oats, and rye progressed favorably. The prospect for fruit remained favorable in the central-east portion of the State.—*C. F. von Herrmann.*

North Dakota.—The month was quite unfavorable for crops of all kinds. The precipitation was considerably below the normal amount, and, owing to the deficiency from former months, quite a serious drought prevailed over the State at the close of the month, on all except some lowlands in river bottoms. Early sown wheat that was up and doing well, dried out in many places, while that sown late failed to germinate. Fortunately the weather was cool and partly cloudy most of the time, which was of great help to all vegetation.—*B. H. Bronson.*

Ohio.—The mean temperature was the lowest ever recorded here in June. Corn was planted late, germinated slowly, and was small at end of month. Wheat was being harvested in south and middle at end of month, with yield less than expected. Oats made fair growth, but headed rather short. Clover and timothy improved; tobacco did very well; early potatoes yield well; gardens and pastures continued good; grapes and blackberries promising; apples promise only light to fair crop.—*B. L. Waldron.*

Oklahoma and Indian Territories.—The weather conditions were more favorable for the cultivation, harvesting, and growth of all crops; corn and cotton fields were well cleaned; early corn was laid by and the late placed to a good stand. Cotton made slow growth, was damaged by web worms, and was in a poor to fair condition. Soft and hard wheat were harvested with fair to good yields over Oklahoma and light to fair yields over Indian Territory. Oats, alfalfa, and hay were being harvested with fair to good yields; the oat crop was deteriorating at the close of the month, due to red rust. Cane, kaffir and broom corn were planted and came up to a good stand; potatoes matured and were being gathered with good yields; range grass made a fair growth and stock was doing well.—*C. M. Strong.*

Oregon.—The early part of the month was dry and quite warm, but during the second decade cooler weather set in and copious rains fell in nearly all sections. The rains were a great help to crops in general, especially fall and spring wheat, which were doing poorly on account of the dry weather. Hops, corn, potatoes, field onions, and sugar beets made satisfactory advance. Haying was delayed on account of the wet weather and lack of sunshine, and some damage resulted to clover and vetch through becoming overripe and lodging. Cherries did not yield well, but there was an abundance of strawberries. Pears, prunes, and some varieties of late apples promise good yields.—*Edward A. Beals.*

Pennsylvania.—The coldest and wettest June in the history of the service. Drought broken and crops revived by copious showers of 6th and 7th, but cool weather and excessive moisture during remainder of the month retarded plowing, planting, and seeding, and was decidedly unfavorable to growth of crops. Month closed with haying and harvesting under way in southern counties; corn backward, weedy and uneven, and growing slowly; pasturage ample; oats, potatoes, truck, and berries satisfactory; timothy improving rapidly; apples filling nicely, and other fruits fair to scarce.—*T. F. Townsend.*

Porto Rico.—Under the favorable conditions generally prevailing vegetation took on a vigorous growth and all crops made marked progress during the month, except over a central area extending from San Juan to Ponce and westward over the south side, where there was a deficiency in the rainfall so great as to check plant growth and in a few instances to cause the death of the plant. The plant canes over this dry section especially are somewhat backward and irregular, as much replanting had to be done. Ratoons, however, look well. The coffee crop is decidedly promising, the trees almost breaking under the weight of the fruit. Experimental cotton is in good condition and promising. The April planting is now maturing. Mango and alligator pear trees are in full bearing with promise of abundant crops. Pineapples plentiful. Small crops and ground provisions in average abundance. Pastures excellent.—*William H. Alexander.*

South Carolina.—Cool nights and excessive precipitation over all but the western parts were inimical to crops, especially cotton. Field crops could not be properly cultivated. Floods and erosive rains damaged bottomland crops and hillsides, but bottomlands were largely replanted to corn. Unusually severe hailstorms destroyed crops over extensive areas, necessitating much replanting. Tobacco suffered severely from hail but otherwise thrived. Minor crops, garden truck, and pastures were not unfavorably affected, except that melons are much later than

In the following table are given, for the various sections of the Climate and Crop Service of the Weather Bureau, the average temperature and rainfall, the stations reporting the highest and lowest temperatures with dates of occurrence, the stations reporting greatest and least monthly precipitation, and other data, as indicated by the several headings.

The mean temperatures for each section, the highest and lowest temperatures, the average precipitation, and the greatest and least monthly amounts are found by using all trustworthy records available.

The mean departures from normal temperature and precipitation are based only on records from stations that have ten or more years of observations. Of course this number is much smaller than the total number of stations.

Summary of temperature and precipitation by sections, June, 1903.

Section.	Temperature—in degrees Fahrenheit.							Precipitation—in inches and hundredths.					
	Section average.	Departure from the normal.	Monthly extremes. Station.	Highest.	Date.	Station.	Lowest.	Date.	Section average.	Departure from the normal.	Greatest monthly. Station.	Amount.	Least monthly. Station.	Amount.
Alabama	73.2	−5.0	Thomasville	99	19	Riverton, Scottsboro.	42	13	4.88	+0.22	Flomaton	9.70	Lock No. 4	2.05
Arizona	77.6	−2.1	Parker	120	28	Willcox	30	3	0.59	+0.39	Fort Defiance	4.67	8 stations	0.00
Arkansas	70.4	−6.5	DeQueen, Warren	99	21	Russellville	37	12	2.53	−1.27	Rison	8.01	Conway	0.45
California	70.9	+0.8	Imperial	121	28	Bodie	14	3, 17	0.07	−0.23	Cedarville	1.78	100 stations	0.00
Colorado	59.0	−4.5	Lamar	101	29	Longs Peak	19	1	2.79	+1.33	Santa Clara	9.25	Cedar Edge	0.16
Florida	78.6	−1.1	Fort Meade, Rockwell	99	20, 26	Molino, Stephensville	54	13	6.69	−0.58	Rockwell	14.54	Malabar	1.64
Georgia	74.4	−3.8	Columbus	101	19	Diamond	41	13	6.00	+1.22	Diamond	11.57	Experiment	2.27
Idaho	64.0	.....	Lewiston, Garnet	99	11, 15	Forney	28	24	1.40	.....	Grangeville	3.86	Blackfoot	0.06
Illinois	66.3	−5.6	Peoria	95	30	Lanark	31	12	2.88	−1.34	Rantoul	6.13	St. John	1.37
Indiana	66.1	−6.1	La Porte	94	30	Greensburg and Veedersburg.	36	13	3.72	−0.29	Butlerville	9.49	Valparaiso	1.32
Iowa	64.6	−5.6	Cedar Rapids and Sigourney.	96	30	Denison	30	4	2.86	−1.52	Humboldt	6.04	West Union	0.75
Kansas	67.2	−6.6	Ness City	103	29, 30	Wallace, Achilles	33	1, 11	2.40	−1.65	Ulysses	7.10	Anthony	0.38
Kentucky	68.6	−5.8	Paducah	96	30	Fords Ferry	37	13	3.61	−0.72	Manchester	6.30	Mayfield	0.70
Louisiana	75.5	−3.9	Rayne	101	19	Mansfield	47	2	4.18	−1.82	Lake Charles	9.14	Ruston	0.99
Maryland and Delaware	66.3	−5.3	Boettcherville, Md.	96	30	Deer Park, Md.	35	2	5.48	+2.16	Bachmans Valley, Md	13.87	Denton, Md	2.10
Michigan	59.8	−4.6	Owosso	94	30	Humboldt	18	10	2.65	−0.49	Detroit	6.32	2 stations	0.35
Minnesota	62.3	−2.6	6 stations	90	6, 14, 27	Pokegama Falls	25	11	1.96	−2.38	Lynd	5.22	Beaulieu	0.36
Mississippi	73.6	−5.4	Laurel	101	7	Walnut Grove	44	14	3.09	−1.69	Natchez	6.58	Boggan	1.04
Missouri	67.3	−6.3	Caruthersville, Princeton	95	20, 30	Ironton, Montreal	36	13	3.25	−1.53	Seymour	8.30	Bethany	1.22
Montana	63.1	+2.8	Miles City	100	17	Toston	26	10	1.66	−0.93	Livingston	3.24	Butte	0.80
Nebraska	64.5	−5.0	6 stations	98	29, 30	Agate	29	10	2.21	−1.65	Odell	5.68	Fort Robinson	0.71
Nevada	64.4	.....	Rioville	113	28	Hamilton	28	10	0.45	.....	Elko	1.60	5 stations	0.00
New England*	59.5	−5.4	Morrisville, Vt	89	6	Patten, Me	21	1	6.71	+3.83	Bemis, Me	14.60	Nantucket, Mass.	1.10
New Jersey	64.0	−5.7	Paterson	92	3	Layton, Charlotteburg	37	2, 5	7.68	+4.20	Dover	15.02	Cape May C. H.	2.39
New Mexico	64.5	−4.9	Alamogordo	108	28	Alma	30	1	3.90	+2.43	Raton	9.44	Cambray	0.43
New York	60.6	−4.6	Elmira	90	30	Beaver	25	1	6.95	+3.46	Wappingers Falls	20.61	Little Falls	2.20
North Carolina	70.3	−4.1	Washington	98	30	Highlands	32	14	6.10	+1.65	Highlands	13.85	Pittsboro	1.92
North Dakota	62.4	−1.6	Napoleon	96	28	Mayville	27	11	1.22	−2.51	Portal	3.13	Mayville	0.04
Ohio	64.4	−5.3	North Royalton	95	30	Millport	35	2	3.97	+0.11	Dayton	9.09	Ripley	2.02
Oklahoma and Indian Territories	70.4	−6.1	Durant, Ind. T	102	18	Patten, Me, Kenton, Okla	35	2	2.10	−1.47	Durant, Ind. T	5.88	Holdenville, Ind. T.	0.48
Oregon	63.6	+3.1	Coyote	110	14	Bend, Silver Lake	26	3	1.70	+0.51	Bay City	6.83	Drain	0.34
Pennsylvania	63.5	−5.1	York	90	7	Dushore	34	1	6.53	+2.72	South Bethlehem	11.76	Confluence	3.74
Porto Rico	79.7	.....	Manati	100	19	Cidra	54	18	5.93	.....	Central Colos	16.70	Barros	0.03
South Carolina	74.2	−3.7	Ratesburg, Liberty	96	21, 30	Clemson College	42	13	8.09	+3.23	Stateburg	18.42	Due West	3.95
South Dakota	65.0	−2.2	Leola	102	17	3 stations	30	11	3.05	−1.04	Ladelle	8.51	Oelrichs	1.00
Tennessee	68.9	−6.2	Jackson, Savannah	95	21	Rugby	32	13	3.95	−0.63	Benton	9.43	Dyersburg	0.58
Texas	74.7	−4.2	Fort Ringgold	107	24	Llano	38	1	4.10	+0.71	Rockport	12.67	Brownwood	0.90
Utah	65.7	+0.8	St. George	110	27	Loa	27	3, 6	0.47	−0.10	Monticello	1.72	3 stations	0.00
Virginia	67.4	−5.7	Newport News	94	30	Burkes Garden	38	24	6.06	+2.09	Charlottesville	15.82	Bristol	1.70
Washington	63.7	+3.1	Ephrata	104	11	Grand Mound	29	3	1.88	+0.26	Clearwater	8.74	Trinidad	0.00
West Virginia	65.1	−5.0	Echo	93	30	Terra Alta, Travellers Repose.	34	18	4.80	−0.08	Terra Alta	12.30	Lillydale	2.01
Wisconsin	62.4	−4.1	Barron	94	27	Koepenick	26	12	1.85	−2.46	Harvey	3.87	Beloit	0.50
Wyoming	58.9	−0.8	Hyattville	102	28	South Pass City	22	11	1.27	−0.13	Moore	3.54	Evanston	0.19

* Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, and Connecticut.

usual. Frequent rains caused much rotting of peaches and grapes. The rains also interfered with wheat and oat harvest, and damaged grain in the shock to some extent. The conditions were more favorable by the close of the month.—*J. W. Bauer.*

South Dakota.—Frost on the 11th affected corn, potatoes, and gardens, but not materially. Drought in some northern counties the latter part of the month injured spring wheat, oats, barley, spelt, rye, and grasses; otherwise these crops and also potatoes and flax did well. Flax and millet sowing was about completed in the second decade. Corn, which was not generally a good stand, due principally to poor seed, was backward, but generally made good progress after the 15th. There was some local damage by hail.—*S. W. Glenn.*

Tennessee.—The month was favorable to crops, although the wet weather the first week hindered farm work and the low temperature throughout the month prevented rapid growth. But the rainfall was generally sufficient. Although somewhat backward at the close of the month corn, cotton, and tobacco were looking well; clover was unusually fine; wheat was yielding much below the average; winter oats were good, but spring oats only fair; a good crop of hay was being harvested; apples promised a fair crop, but peaches were scare.—*H. C. Bate.*

Texas.—The month was the coolest June on record. With the exception of the southern and north-central portions, which experienced drought until the general rainfall of the 13th and 14th, all sections received sufficient moisture throughout the month to keep vegetation in good growing condition. The cool weather of the first half greatly retarded the growth of cotton; under more favorable temperature conditions the plants made very rapid growth the latter half, but the crop was between two and three weeks later than usual at the close of the month. Corn made very rapid growth and an average yield of the early planted is assured. Grain was harvested. Wheat, rye, and fall oats made about the average yield and spring oats a light yield. Rice, sugar cane, and miscellaneous crops did well.—*L. H. Murdoch.*

Utah.—The weather during June presented no unusual features. Precipitation was mostly local in character and was unevenly distributed. Vegetation on irrigated soil made a rapid growth, but dry land crops suffered greatly from lack of moisture. The cutting of fall wheat had begun in the extreme southern counties, and the yield will be light. Spring wheat and oats, as well as sugar beets, were in good condition, and indications pointed to good yields. The harvesting of alfalfa was completed during the month and average yield were generally realized. Pastures were drying up and the supply of irrigation water, though still ample, was preceptibly diminishing.—*R. J. Hyatt.*

Virginia.—Considerable cool weather prevailed over the State throughout the month, particularly in the opening days and again about the 13th to 17th, while the precipitation was quite decidedly above normal. Crop growth was, on the whole, favorable. Both winter wheat and oats ri-

pened and harvest was begun and gardens, pastures, and meadows did very well. The usual June crop of apples occurred, but it was for the most part not excessive, and an average crop was left on the trees.—*Edward A. Evans.*

Washington.—Although the mean temperature of the month was high and the precipitation somewhat above normal, yet both were so badly distributed that the effect on the crops was not so beneficial as it ought otherwise to have been. Burning winds injured wheat during the period from the 6th to the 11th. The first week of the month was cool, with severe frosts on the 3d; the last week was cool and showery, which was beneficial for filling wheat. The prospect is for a short wheat crop. Not much haying done yet.—*G. N. Salisbury.*

West Virginia.—Showery weather, with moderate temperature and ample sunshine, generally favorable for crop growth, except corn, for which the nights were rather too cool. At the close of June wheat and rye harvest were well advanced over the southern section, with fair to good yield; oats were greatly improved and meadows were making good growth, with prospect for better hay crop than expected; gardens and potatoes were doing finely and millet was promising; apples were generally a poor crop, except in some counties in the panhandle section, where they were promising.—*E. C. Vose.*

Wisconsin.—The month was deficient both in warmth and moisture, but mainly favorable for oats, barley, spring and winter wheat, and rye. Corn made very slow growth and at the end of the month was much below the normal condition. On the 11th and 12th a severe frost occurred generally over the State, except in the extreme southern counties and along Lake Michigan, doing considerable damage to winter rye, corn, and small fruits in exposed localities.—*W. M. Wilson.*

Wyoming.—The abundant and well distributed showers during the first two decades of the month were very beneficial to the ranges and meadows, which at the close of the month were generally in excellent condition. The prevailing cool weather during most of the month retarded rapid advancement of grain, gardens, and alfalfa, and those crops at the close of the month were nearly two weeks backward, although usually in good condition.—*W. S. Palmer.*

SPECIAL CONTRIBUTIONS.

"LA LUNE MANGE LES NUAGES." A NOTE ON THE THERMAL RELATIONS OF FLOATING CLOUDS.

By Mr. W. N. SHAW, F. R. S., F. R. Met. Soc.

[Reprinted from Quarterly Journal of the Royal Meteorological Society, 1902, pp. 95-100.]

It is always difficult to be sure that different persons are in agreement in identifying meteorological phenomena, and I will therefore state in a few words the conditions to which, according to my notions, the French proverb refers.

A single layer of drifting fleecy clouds—detached stratus—is rendered visible by the illumination of the moon not very long after sunset. The illumination not only shows the clouds, but shows that they are diminishing, and finally the moon is left in possession of an unusually clear sky. If this is not a correct description of the phenomena to which the proverb refers, it describes a state of things for which I desire to suggest a physical explanation which is not without interest.

I will put the matter in another way: A floating cloud, a finite mass of air carrying water particles, is losing heat by radiating into space through the clear air above it more heat than it receives from the earth beneath; the water globules will, in consequence of this loss of heat, evaporate, and the cloud will vanish. The converse of this proposition may be stated in slightly different form, thus: A floating cloud is receiving heat from the sun above and the earth beneath, and in consequence of this gain of heat condensation will take place, and the cloud become thicker.

These statements are paradoxical, and to exaggerate the apparent paradox it is only necessary to point out that, as the cloud consists of saturated air, evaporation means a rise of temperature, condensation a fall of temperature; for evaporation implies more vapor in the gaseous form, which is only possible at a higher temperature, and vice versa. So we may reduce the proposition from the meteorological form to a more conventionally physical one, and say that the abstraction of heat from a floating mixture of air and water will cause elevation of its temperature, or briefly, will warm the mixture, whereas the addition of heat will cool it.

The explanation of the apparent paradox is a simple one, as may be seen from the following consideration:

Suppose a mass of moist air at the surface of the earth to be warmed; it rises, and in consequence expands adiabatically and cools. Suppose that it rises just sufficiently high to form a cloud; then if it had been less warmed it would not have risen high enough for condensation to take place. If it had been more warmed it would have risen higher, and a cloud might have been formed even denser than in the first case. Supplying less heat before the condensation took place is, of course, equivalent to removing some after the first condensation occurred; one side of the proposition follows therefore at once, if we can assume that the cloud was formed by the adiabatic cooling of rising air. It is, of course, the changes of pressure incidental to differences of level (due to change of density) which produce the paradoxical thermal effects. But although this mode of treating the problem shows well enough that a cloud which is losing heat by radiation into space will grow warmer and disappear, it does not give any satisfactory proof that the cloud would grow thicker if the sun shone upon it.

The course of events for a floating cloud can, however, be very clearly followed out by means of Hertz's diagram of thermal lines for moist air, which is published in Vol. I of the Meteorologische Zeitschrift, and is reproduced in Waldo's Modern Meteorology.[1] The diagram represents the state of a mixture of air and water under varying conditions of pressure and temperature, the lines of reference being set out according to the logarithms of the pressure and of the temperature from absolute zero. Since the pressure scale is logarithmic, equal intervals along it correspond approximately to equal steps of height in the atmosphere. The adiabatic lines for different stadia and the lines of saturation for given percentage composition, enable all the changes in thickness of a cloud under varying quantities of heat to be followed. The diagram is approximate only, but sufficiently nearly accurate to indicate satisfactorily the changes that take place in floating cloud. For this purpose we must add to the diagram a line indicating the relation of temperature and height, or pressure, for the atmosphere in equilibrium, i. e., the line of temperature gradient. This, of course, is a variable line, depending on the condition of the upper atmosphere for the time being; but supposing, for example, the temperature gradient to be uniform and equal to 0.5° C. for every 100 meters (as given by Berson's figures for heights up to 2000 meters), we get a line across the diagram nearly straight, and dropping 1° in temperature for every 200 meters of height, as shown at the base of the diagram. The direction of the line being fixed, its position on the diagram must be defined by drawing it in the proper direction through a selected point representing the condition of a floating cloud. We may take a water cloud just above the freezing point, say at 5° C., at 1200 meters height. Through the point identified by these conditions we can draw the equilibrium line of temperature, and know that whatever be the initial state of a mass of air it will rise or sink, following the changes which Hertz's diagram represents, until the equilibrium line is reached. In fig. 1 certain parts of Hertz's diagram are reproduced and the equilibrium line is added. The point A represents the state of the floating cloud at 5° C. at 1200 meters, saturated with about 6.2 grams of water vapor per kilogram of mixture, as indicated by its position with reference to the saturation lines which are dotted in the figure. QAQ' is the adiabatic line for saturated air. SAS' is the saturation line for 6 grams of moisture per kilogram of mixture; the dotted lines parallel to this on either side represent the saturation lines for 7 grams and 5

[1] The complete memoir is given in Abbe's Mechanics of the Earth's Atmosphere.—ED.

grams, respectively. *EAE'* represents the equilibrium or temperature gradient line. This line is a little less steep than the adiabatic lines for saturated air, but decidedly more steep than the saturation lines. If we start from the point *A* on the equilibrium line, representing the condition of the floating cloud, the addition of heat (supposing the cloud always to rise until it recovers its equilibrium) means that the point will travel along the equilibrium line *AE* to the left; the temperature will fall, since the slope is downward; and, since the equilibrium line is steeper than the saturation line, the point will pass into the part of the diagram where saturation requires less moisture, in other words, condensation will take place. Abstracting heat, on the other hand, means traveling along the equilibrium line in the opposite direction, *AE;* the air passes into a region where more water is required for saturation. Hence, evaporation takes place. Since the slope of the equilibrium line is upward, the temperature rises.

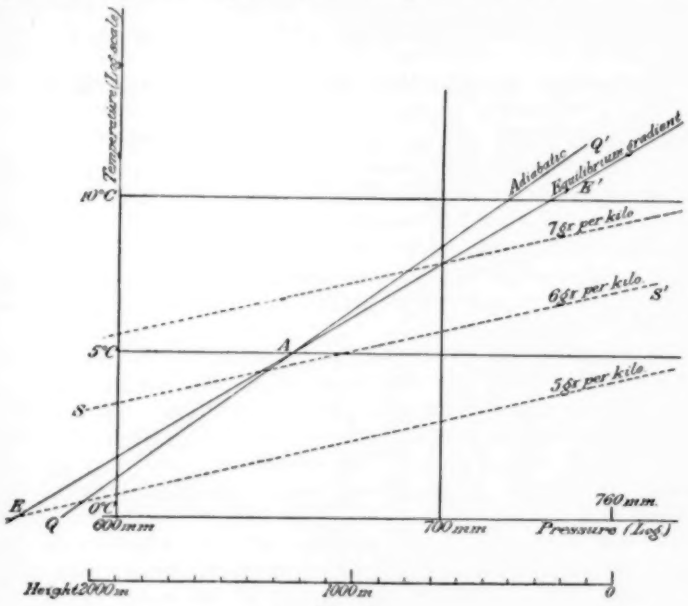

FIG. 1.

It is interesting to note that the result of warming a mass of floating air depends upon the temperature gradient for height of the air in which it floats. If the law of fall of temperature with height were the adiabatic law, a mass of air at the foot warmed ever so little above its surroundings would rise without limit. An inversion of temperature, on the other hand, would at once prevent any rise taking place, or speedily arrest it. A temperature gradient exactly parallel to the saturation line would indicate the conditions under which a cloud might receive or lose heat and change its temperature without any evaporation or condensation taking place.

It thus appears that, except in cases of an "inversion of temperature," or of a zero temperature gradient, meteorologists, in considering the properties of floating masses of air, have to consider that the ordinary relations between the increase of heat and increase of temperature must be reversed.

It is, of course, possible to suggest other physical explanations for the disappearance of clouds in accordance with the French proverb, and my excuse for suggesting one which may seem fanciful, is that it brings into prominence certain physical relations which are certainly real and are not generally noticed.

I ought to add a word with regard to the conveying of heat to a cloud by radiation. I have spoken as though the distribution took place throughout the cloud, and not, as would possibly appear more likely, at the upper or lower surface only. Although the confining of the addition of heat to the outer portions only would not affect the physical principles involved, I may mention a defence of these views that the clouds in question are generally very thin and very translucent, so that every part of the cloud is illuminated by the moon's rays, and consequently is exposed to other sources of radiation.

The extent to which clouds can absorb or emit radiation has not yet been ascertained, but there is no question that they are more effective radiators and absorbers than clear air.

It will be noticed that I have passed over any suggestion that the lunar radiation itself adds heat to the cloud. Possibly it does, but the amount of heat so gained must in any case be small compared with that lost by radiation to the rest of a clear sky, so that any effect of direct radiation from the moon may be quite properly disregarded.

The effect of difference of temperature gradient upon the increase or diminution of density of floating clouds with accession of heat, is one that may have many other applications than the one here referred to. It would seem, for example, to furnish a criterion for determining whether the action of the sun upon mist lying on the ground would result in dispersion of the mist, or the lifting of the mass as a cloud either directly upwards, or possibly creeping along a hillside till the top is reached.

The observations of temperature gradient by the ascent of kites would probably afford facilities for testing by observation the effects which have here been theoretically indicated.

ADDENDUM.

Since the above was written I have put together an arrangement of apparatus whereby the conditions applicable in the case of a floating cloud can be experimentally realized. The essential condition of the arrangement is, that the communication of heat to a limited mass of air shall result in a diminution of the pressure of the air, just as the communication of heat to a floating cloud results in the diminution of pressure as the cloud rises to a higher level. In the apparatus the necessary condition is secured by using a movable cistern of mercury to close the vessel containing the moist air. For this purpose the air is conveniently contained in a globe, *G*, fig. 2, surmounting a vertical tube open at the bottom. The globe with its vertical tube is fixed in a stand, and the open bottom of the tube dips into the mercury in the cistern *C*. The mercury cistern rests upon one end of a board, *B*, about 5 feet long, which is balanced upon a knife edge, *E*, the mercury and its containing vessel being counterpoised by suitable weights, *P*, (about 6 pounds) at the other end of the board. The mercury vessel is thus supported by one arm of a rough balance, and,

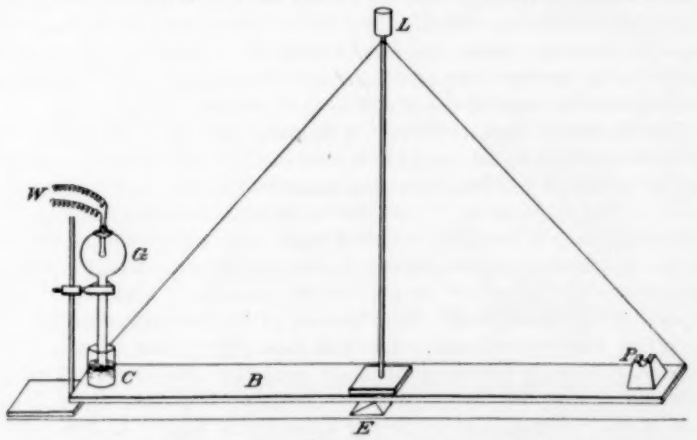

FIG. 2.

since all the weights on the balance are above the point of support, the balance, regarded apart from the effect of the elasticity of the air in the globe, is unstable. The instability is the essential feature of the arrangement, and is largely exaggerated by mounting a heavy mass of lead, *L*, on an iron

stand attached to the middle of the balancing board, so that the lead is about 5 feet above the board. The globe is provided with tubular apertures, not shown in the figure, to allow it to be filled with saturated and nucleus-laden air at pleasure; but during an experiment these apertures are closed. It is also provided with wires, *W*, led through an india rubber bung, and connected in the interior of the globe by means of a fine platinum wire, to allow heat to be supplied to the air at pleasure by passing an electric current through the fine wire.

When the globe has been filled with suitable air, and the apertures closed, any motion of the board diminishes or increases the pressure in the interior by the motion of the mercury vessel. The increase or diminution of pressure tends to resist the motion of the board, and by adjusting the positions of the counterpoise and the lead weight, the arrangement can be made to balance just within the limits of stability, when the elasticity of the enclosed air is taken into account. When this adjustment is made, it is clear that a slight motion of the board in the direction of increasing the volume of the enclosed air throws over the lead weight toward the same side as the globe, and brings to bear a largely increased moment of forces tending to continue the expansion; so that the ultimate expansion resulting from any cause tending to depress the balance on the globe side produces a rarefaction depending on the degree of dynamical instability of the balance. Such a cause arises when the air in the globe is slightly warmed by passing a current through the wire. If the mercury vessel were fixed, the heating would produce increase of pressure in the closed space, and consequently increase of pressure in the mercury surface supported by the board. As, however, the balanced vessel is movable, the balance comes over, and then the dynamical instability causes expansion, determined not solely by the amount of heat which originated the motion, but by the loads on the balance and their position.

The success of the experiment, for the demonstration of the production of a cloud—i. e. a diminution of temperature—on heating, depends upon the proper selection of the area of the tube in comparison with the volume of the globe. I have found a 4-inch globe with a 1½-inch tube give completely satisfactory results. The counterpoising weights are about seven pounds on each side, and the lead weight with iron stand supporting it, perhaps fifteen pounds. Under these conditions, with the globe filled with saturated air and closed, and the mercury vessel properly counterpoised, the commencement of heating at once determines a depression of the board on the globe side, a rarefaction corresponding to about three-quarters of an inch of mercury and an abundant cloud. The experiment can be repeated with the same air, after readjusting the balance, until the exhaustion of nuclei for the deposit of globules makes the arrangement insensitive. Its activity can always be restored by refilling it with suitable air.

The degree of instability of the balance corresponds to the temperature gradient for height in nature. I have not yet formed an estimate of the temperature gradient to which my arrangement of the apparatus would correspond. But the analogy between the two is formally correct, and with a slight modification of the apparatus the equivalent temperature gradient could be determined. It would be still more strikingly clear to the eye if the globe and tube were attached to the balance and the mercury reservoir fixed. In that case the globe of air would indeed rise with increase of heat, and the arrangement would become simply an apparatus for multiplying the effect of the rise, a rise of 2 inches with my apparatus being equivalent to a rise of about five hundred feet in nature. It thus becomes a comparatively simple means of conducting in the laboratory, operations which really take place on a large scale in nature.

CLIMATOLOGICAL DATA FOR JAMAICA.

Through the kindness of Mr. H. H. Cousins, chemist to the government of Jamaica and now in charge of the meteorological service of that island, we have received the following table in advance of the regular monthly weather report for Jamaica:

Comparative table of rainfall for June, 1903.

Divisions.	Relative area.	Number of stations.	Rainfall.	
			1903.	Average.
	Per cent.		*Inches.*	*Inches.*
Northeastern division	25	24	6.32	9.86
Northern division	22	53	5.16	4.80
West-central division	26	26	8.53	9.08
Southern division	27	36	3.99	5.72
	100	139	6.00	7.36

The rainfall for June was therefore much below the average for the whole island. The heaviest rainfall was 17.93 inches at Brownsville in the west-central division, while 0.48 of an inch fell at Port Royal Naval Hospital in the southern division.

TORNADO AT GAINESVILLE, GA., JUNE 1, 1903.

By Mr. J. B. MARBURY, Section Director, Atlanta, Ga.

On the afternoon of June 1 one of the most destructive tornadoes in the history of Georgia struck the outskirts of the City of Gainesville, in Hall County, about 50 miles northeast of Atlanta. The track of the storm was about 4 miles in length and from 100 to 200 feet in width.

The course taken was from southwest to northeast along the southern outskirts of the city, and was marked by death, destruction, and desolation.

The city proper is situated on an elevated plateau about 1300 feet above sea level, but the section passed over by the tornado runs northeast and southwest around the town, and is over 100 feet lower, forming a miniature valley-like depression with hills on either side. The devastated territory was occupied by several large cotton mills and the homes of employees and the negro element of the city. The fearful death list is due to the crowding together of so many persons employed in the doomed mills. Most of the negroes were away on a large picnic excursion, or the loss of life would doubtless have been doubled.

The weather map for the morning of the 1st presented no abnormal features, certainly nothing heralding any severe storms. Cloudy and unsettled weather covered the major portion of the country, and thunderstorms occurred at numerous points in middle and northern Georgia during the preceding night. The pressure was highest over the Great Lakes with the barometer 30.40 inches at Marquette, Mich. The lowest pressure east of the Rockies was in Missouri where it was but little lower than normal. The temperature was below 70°, except in the southeastern portion of this State.

During the early hours of the day the weather was somewhat erratic, alternating between suushine and light showers with rather oppressive temperature. About noon heavy black clouds were seen forming in the southwest and soon continuous, though at first distant, thunder was heard. At the same time the wind blew briskly from the northeast, increasing in force as the clouds approached. A few moments later regular tornado clouds began forming, first in the southwest, and later in the west and northwest, in which was noticed what seemed to be a violent whirling motion; at the same time clouds were observed rushing in nearly all directions toward the tornadic disturbance. The tornado clouds were of the characteristic greenish hue, increasing in their horrible grandeur as they drew nearer. The clouds so closely resembled smoke that many thought it was smoke from an approaching locomotive; the cloud was approaching along the general direction of the Southern Railway. This appearance preceded by only a few seconds the development of the funnel-shaped cloud which

descended toward the earth. Then there was a few seconds of death-like calm, the thunder ceased. Soon, to the southwest was heard a deafening roar. The funnel-shaped cloud kept close to the surface and began its deadly work about one mile southwest of Gainesville, striking a large cotton mill at exactly 12:45 p. m., eastern time, just 10 minutes after 750 employees had filed into the great structure from dinner. Only the fourth and fifth floors of this building were injured by the wind, although the entire structure was damaged by the heavy downpour of rain. On the top floor of the mill were employed 250 children, and it was here that the greatest loss of life occurred. The force of the wind tore the roof and top story off and hurled giant timbers and massive blocks of marble for a distance of more than a hundred feet. Children employed in the spinning room were hurled to the ground and instantly killed. Only two or three bodies were found inside the building, the rest were buried in the débris in front of the building. The fifth floor of the mill fell forward in the direction of the storm's progress, while the rear end remained almost intact, the floor slanting at an angle of about 45°. For half a mile to the southwest of the mill trees were blown down and a few outhouses wrecked, but no great damage was done. The village of the mill where most of the employees live, in 80 of the company's houses, was absolutely unharmed by the storm. This is due to the fact that this village stood on a high hill above the mill.

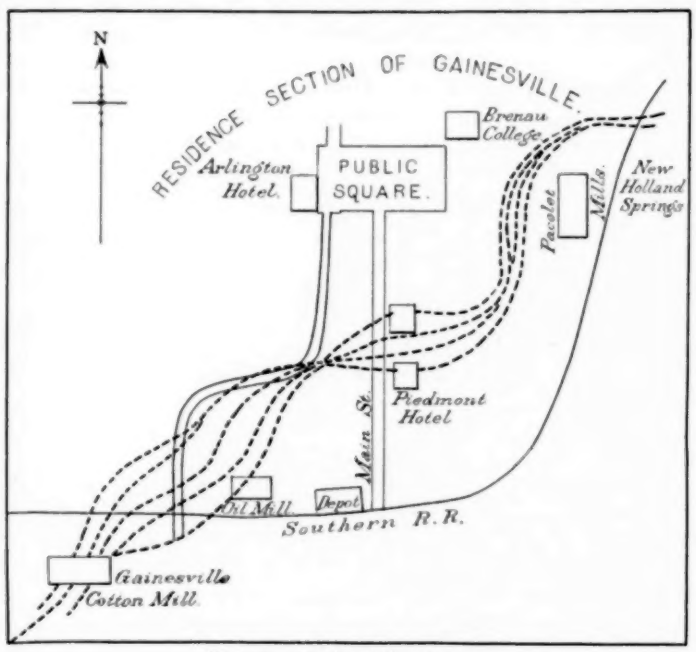

FIG. 1.—Path of the storm.

The walls of the mill fell outward and the roof was lifted into the air and held suspended for several seconds, showing that a decided vacuum was formed just over the doomed building.

The people in the building had no opportunity to prepare for the great danger. Clouds overhung the sky most of the morning, but they looked like many other rain clouds they had seen, and no special attention was paid to them. With a roar and a rush sounding like "a hundred express trains" the storm came down upon the unsuspecting victims with all its maddening fury. The fury of the gale lasted only a few seconds, when the air became as quiet and still as death for a few moments. Then the rain came down in torrents, accompanied by vivid lightning and wild rolls of thunder. During this time the rescuers worked among the débris.

In the rear of the mill was an immense standpipe, fully 50 feet off the ground and about 50 feet tall in itself. This standpipe was about 40 feet in diameter and was covered with an immense sheet iron cupola. This great cupola, weighing several tons, was lifted bodily from the top of the standpipe, carried high into the air, and dropped about a hundred feet in front of the mill, killing several persons who had thus far escaped danger. With the exception of the loss of the cupola, the great standpipe was uninjured. A brick chimney 125 feet high and directly in the path of the storm was uninjured.

The next building in the path of the storm was the Gainesville Iron Works, which was badly damaged; the roof was blown off and the walls thrown out of plumb, but no lives were lost, as no one was in the building at the time.

The storm then jumped across the tracks of the Southern Railway Company, destroying the switch signals and targets and all telegraph and telephone poles along its track. Freight cars standing on the side tracks were taken up bodily and thrown against a near embankment. In some instances cars were lifted from the trucks and carried some distance away; others were carried away trucks and all. Huge pieces of timber and logs were carried along with frightful velocity.

When the storm first crossed the railroad tracks it seemed heading directly toward the center of the city, half a mile distant, but it swerved to the east, cutting a path from 200 to 300 yards wide, until it struck the mill village of New Holland, 2 miles northeast of the Gainesville depot. At New Holland, where is located the Pacolet Mills, one of the largest cotton manufacturing plants in the South, the course of the storm turned and the mill was but little damaged, but the village of cottages, where lived the 1300 employees, was almost entirely destroyed. Out of 120 cottages about 70 were totally wrecked. Hundreds were at work in the mill and were saved, but a large number, especially the aged women and small children, were in the cottages and many were killed. It is estimated that at least $100,000 damage was done goods and machinery at this mill.

After leaving New Holland the fury of the storm lessened so rapidly that, beyond a few fences and small trees being blown down, no damage was done. The entire track of the tornado was about 4 miles. In all, 98 persons were killed, nearly double that number injured, while the money value of the property loss amounted to about $1,000,000.

CLIMATOLOGY OF COSTA RICA.

Communicated by Mr. H. PITTIER, Director, Physical Geographic Institute.
[For tables see the last page of this REVIEW preceding the charts.]

Notes on the weather.—On the Pacific slope the weather showed no marked abnormalities. Rain was moderate although slightly above the normal. At San José pressure, temperature, and relative humidity were very near to the means of the foregoing years of observation. Sunshine, 165 hours against the normal of 133 hours. On the Atlantic slope the rain was in excess, with intermediate weeks of drought at the coastal stations, while in the mountains the rainfall, also generally heavier than usual, was more continuous.

Notes on earthquakes.—June 24, $7^h\ 14^m$ a. m., slight shock NW–SE, intensity II, duration 3 seconds.

WEATHER REPORTS FROM VESSELS AT SEA.

By Prof. A. G. MCADIE, dated June 19, 1903.

In reply to an inquiry concerning the meteorological reports which were received daily from the cable ship *Silvertown* by the district forecaster at San Francisco during the time when the vessel was engaged in laying the American transpacific cable, the following brief article is submitted:

From December 14 until December 24, 1902, through the courtesy of Captain Morton of the steamer and Mr. H. Benest, Chief of the Cable Expedition, the weather conditions prevail-

ing at sea were transmitted daily to the Weather Bureau office at San Francisco. These were carefully plotted from day to day and were utilized with good results by the forecast official.

The Commercial Pacific Cable Company is now (June, 1903) laying nearly 10,000 nautical miles of cable across the Pacific Ocean. The cable is laid in sections running from San Francisco to Honolulu, from Honolulu to Midway, Midway to Guam, Guam to Manila, and from Manila to Shanghai. This will not be the first cable across the Pacific, making complete the circuit of the world for cabling purposes. The British Pacific cable running from Victoria to Fanning Island, to Fiji, to Norfolk, to Southport and to Doubtless Bay, was completed October 31, 1902. The line was opened for commercial business during the first decade of December, 1902. The length of the British Pacific cable is 7900 nautical miles. A detailed description of the laying of the American transpacific cable is given by the writer in the Journal of Electricity, Power, and Gas, San Francisco, Cal., January, 1903.

Through the courtesy of Mr. Clarence H. Mackay and Mr. Geo. H. Ward the Weather Bureau office at San Francisco was enabled to test the value of weather reports from the Pacific Ocean. The following table gives the daily run of the ship and her position at noon, ship's time, when weather reports were cabled:

Date.	Position.		Total cable laid.	Soundings.
	Lat. N.	Long. W.		
1902.	° ′	° ′	*Miles.*	*Fathoms.*
December 15	37 8	123 47	77	1,800 Mud.
16	35 50	126 44	259	2,550 Yellow ooze.
17	34 36	129 59	455	2,700 Brown ooze.
18	33 14	133 30	662	2,685 Do.
19	31 39	136 46	865	2,550 Do.
20	30 18	139 38	1,054	2,480 Do.
21	28 44	143 2	1,269	2,725 Do.
22	27 7	146 16	1,480	2,820 Do.
23	25 39	149 8	1,677	2,880 Do.
24	23 57	151 20	1,894	3,016 Do.
25	22 22	155 23	2,109	2,426 Do.
26	21 18	157 50	2,238	450 Do.
	Honolulu *			

Connections at Honolulu, 38 miles; in all, 2276.317 nautical miles.

* Hawaiian standard time is based on standard meridian, 157° 30′, or ten hours and thirty minutes west of Greenwich. Honolulu local mean time is ten hours and thirty-one minutes slow of Greenwich. San Francisco local mean time is three hours and ten minutes slow of Washington.

NOTE.—The United States Coast and Geodetic Survey is now sending a series of time signals over the cable for determining longitude of Honolulu. The exact time difference has doubtless been determined to a fraction of a second.

While the cable was being laid communication with the shore was restricted to one hour in every twenty-four, as a rule the hour beginning with the ship's noon. Insulation tests of the cable were made every five minutes. The first report from the *Silvertown* was received on December 15, when the vessel was about ninety miles off shore. An interesting fact is that the steamer was experiencing strong southeast winds with rain, while at San Francisco, ninety miles to the northwest,[1] the wind was northwest and weather cloudy. At Point Reyes Light, however, thirty-five miles northwest of San Francisco, the wind was southeast. The wind was also from the southeast at Mount Tamalpais. It appears then that at San Francisco there still existed a stream of air flowing near the surface of the earth from the great valley to the sea, while within comparatively short distances, both horizontally and vertically, air currents were moving at an angle of 90° with this. The wind at sea was southeast.[2] The second message received from the *Silvertown* indicated the existence of a disturbance off the coast of southern California, with strong northwest winds prevailing at sea. The pressure conditions shown on the forecast map a few hours later indicated the probable approach of a storm which would reach the coast south of Point Conception and move eastward across southern California and Arizona. Forecasts of *rain* for southern California and of *fair* weather for northern California were issued. By the morning of December 17 the rainfall at Los Angeles amounted to 1.34 inches; at San Diego, 1.72 inches. In northern California no rain fell.

The third message received from the steamer, December 17, while in 34° 36′ north and 129° 59′ west, indicated the passing of the disturbance at sea; terrific seas had prevailed all night of the 16th, followed by a heavy swell on the 17th, with partly cloudy weather. Conditions were still favorable for rain along the Mexican boundary, and forecasts were made in accordance therewith. All succeeding reports indicated fair weather for California.

We now know that at Honolulu the lowest pressure, 29.73 inches, occurred on December 10, and that a disturbance was then passing eastward over the Hawaiian Islands. It is also noticed that Mauna Kea and Mauna Loa were heavily covered with snow in the storm of the 11th to 13th. It may be inferred that the disturbance from the Hawaiian Islands moved slowly northeastward across the Pacific in six days, the average velocity being about fifteen miles an hour. It is of further interest to note that this disturbance apparently preserved its identity in crossing the United States. In the MONTHLY WEATHER REVIEW for December, 1902, on Chart II, "low" area marked "No. V" is doubtless the same disturbance which reached the Pacific coast near San Diego on December 16, 8 p. m. This disturbance is charted as leaving the United States near the mouth of the St. Lawrence on December 22. It would be interesting to know the further history of the disturbance.

[1] Northeast. (?)

[2] In the opinion of the district forecaster, the wind directions at San Francisco are largely influenced by the peculiar topography of the district.

THE EARTHQUAKE OF JUNE 2, 1903, AT WASHINGTON, D. C.

By C. F. MARVIN, Professor of Meteorology.

At 8h 27m 0s, June 2, 1903, the new Omori seismograph at the Central Office of the Weather Bureau began the registration of an earthquake which is the second one recorded since the apparatus was set up in February of this year. The disturbance was inappreciable to ordinary sensations, but it is evident from the record that at its origin it was undoubtedly of very considerable severity. It is also seen that the movement of the earth had traveled a long distance before reaching Washington.

The reader is referred to section *C* of fig. 1, page 126, of the March REVIEW for an illustration of an earthquake record by the Omori instrument. The present record, which is not reproduced, is very much longer and shows much more complex movements of the earth than in the earthquake of March 15. The following table gives the times of occurrence of the principal features of the record:

June 2, 1903, (75th meridian time).

	H.	*m.*	*s.*
First preliminary tremor	8	26	32
Second preliminary tremor	8	33	8
Principal portion began	8	43	2
Principal portion ended	8	48	49
Duration of the end portion	0	43	28
End of earthquake	9	32	16
Total duration	1	5	46

Maximum double amplitude of strong waves in the principal portion, 0.22 millimeter.
Period of the pendulum, 26 seconds.
Magnification of record, 10.

AUTUMNAL COLORATION OF FOLIAGE.[1]

By Mr. A. F. WOOD, Pathologist and Physicologist, Bureau Plant Industry, U. S. Department of Agriculture.

The production of color in autumn foliage is, as is well known, due in part to the gradual destruction of the chlorophyll when the leaves have reached maturity and approach the

[1] Advance copy from an article on Autumnal Coloration in the Encyclopedia of Horticulture.—ED.

period of death, and in part to the action of acids on anthocyanin as described below. Many of the destructive changes which take place in the chlorophyll are oxidation processes, the same as occur in the cells of highly colored variegated plants, and physiologically they are not very different from the changes occurring in calathea, caladium, codiæum, etc. The approach of maturity in the leaf, and the coming on of cool weather in autumn, stimulate the production of oxidizing ferments, and the action of these and the acids of the cell sap upon the chromogen, or color contents of the leaves, especially the chlorophyll and anthocyanin, causes many of the brilliant colors of autumn foliage. There is a popular belief that these colors are due to cold weather or frosts; but while frosts, if they are light, hasten the solution and destruction of the chlorophyll, they can not be looked upon as more than hastening changes, which would occur in time without them. Even in the Tropics, some foliage before it matures becomes highly colored, and on the Japanese maples the writer has observed beautiful autumnal colorations in July in the region of Washington.

In practically all deciduous trees, bushes, etc., before the maturing and falling of the leaves, all of the valuable food materials, such as sugars, albuminoids, etc., pass from the leaves through the vascular bundles into the twigs and branches, so that they are not lost to the plant. When the leaves finally fall they are therefore nothing but mere skeletons, containing waste materials. In the passage, especially of albuminoid matters from the leaves to the stems, it is necessary that the materials be protected from the strong action of light, and it is believed that part of the coloration of maturing leaves serves the purpose.

A coloring material, or chromogen, known as anthocyanin, is always present in such cases, and develops beautiful reds when the cell sap is acid, blue when no acids are present, and violet when there is only slight acidity. This, in connection with the disorganizing chlorophyll, causes the various mixtures of yellow, brown, violet, red, orange, etc., of autumnal coloration as described above. In very young leaves of many plants, such as *Ailanthus glandulosa, Juglans regia, Vitis, Cissus*, and many other plants, this same anthocyanin is developed as a protection to the albuminoid materials traveling to the young cells. Such protective colorations have to be distinctly separated from variegations. In evergreen leaves, during the winter, the chlorophyll granules are protected by the development of anthocyanin, forming a brownish or reddish tinge in the cell sap. This is especially prominent in many conifers.

While, as stated above, these protective and in some cases transitory colorations should be clearly distinguished from variegation, it is an interesting fact that they develop when the conditions for active nutrition are unfavorable, and may, in many cases, be produced in maturing leaves by starving the plants or permitting them to become sufficiently dry to check growth.

THE WEATHER BUREAU SEISMOGRAPH.

By Prof. C. F. MARVIN, dated July 1, 1903.

It has always been the policy of the Weather Bureau to require its observers to take careful note of earthquake phenomena of sufficient intensity to be felt at stations, but no specific effort has been made to provide generally the instrumental means by which such phenomena could be automatically recorded and measured. The Central Office at Washington has, however, maintained a simple form of seismograph in operation ever since December, 1892, and recently has greatly improved its equipment by the installation of one of the large horizontal pendulums made by J. & A. Bosch, of Strassburg, and designed after the models described by Omori.[1]

[1] Publications of the Earthquake Investigation Committee in Foreign Languages. No. 5. Tokio, 1902.

The older form of the Weather Bureau seismograph was described by the writer in the MONTHLY WEATHER REVIEW for July, 1895, Vol. XXIII, p. 250.

The new instrument is of a very superior type and gives an accurate record of the movement of the earth at the pendulum in the horizontal plane. At the present time but one of the two pendulums constituting the set has been installed and this produces a record of the north and south component of horizontal motion.

The mechanical principles involved in the construction of a seismograph of this type were first developed and applied to the measurement of earthquakes in the latter part of 1880 by James A. Ewing, then Professor of Mechanical Engineering at the University of Tokio, but now Professor of Mechanism and Applied Mechanics at the University of Cambridge, England. Numerous modifications have since been incorporated in the instrument by Gray, Omori, and others, and in its present form it is well adapted to measure and record all kinds of earthquakes, except, perhaps, the most destructive, and is especially suited to register the feeble, unfelt earthquakes, which frequently occur in all parts of the world.

The instrument as set up to photograph is shown in fig. 1. As actually installed in a small basement room of the Weather Bureau, the separate castings are secured to thick blocks of stone cemented firmly into the concrete floor of the building and projecting but a few inches above the floor level. The heavy casting *A* forms the support for the so-called horizontal pendulum *B C D*. *C* is a massive lead weight, rigidly attached to the conical tubular rod *B*, the end of which, at *B*, terminates in a hardened steel plug, hollowed out cup-wise and highly polished. At this point the pendulum is supported upon a sharp, conical pointed stud of hardened steel fixed to the casting *A*. The remaining support for the pendulum consists of a pair of steel wires, faintly seen at *w w* in the picture. At the weight end these are attached to eyes with a knife-formed inside edge and there engage two studs that project laterally from the mass *C*. At *D* the wires are united to a stirrup, which at the point opposite the wires is provided with a bit of hardened steel formed with a cup-shaped recess and highly polished. Here the stirrup is supported on a sharp, hardened steel cone attached to the carrier *E* forming the summit of the casting *A*. The carrier *E* is provided with several adjusting screws; thus, *a* serves to raise or lower the weight *C* and thus adjust it to a horizontal position, while *b* causes the point at *D* to move away from or nearer to the top of the column, and, finally, a pair of screws, one of which is seen at *c*, gives *D* a lateral motion in the horizontal plane. In short, the pendulum *B C D* is supported at *B* and *D* on sharp steel points and swings, therefore, with great freedom of motion. If the points *B* and *D* are rigorously in a vertical line, the pendulum is in neutral equilibrium and the mass *C* will then remain at rest in any position. For practical work, however, a small degree of stability must be imparted to the mass *C*, otherwise minute changes of temperature and other influences which it is impossible to control will cause the mass *C* to wander about from one position of rest to another. The desired degree of stability is given to the pendulum by means of the screw *b* and the azimuth of the point of rest is adjusted by the screws *c*. The degree of stability is determined by noting the time of vibration of the mass *C*, which can be adjusted to swing as slowly as one complete vibration in thirty or forty seconds. A period of twenty-five to thirty seconds seems to contribute a sufficient stability for practical work.

The whole object sought in this construction is to secure a "steady mass," as it is called; that is, a mass that shall remain quite at rest during an earthquake, notwithstanding that the earth and the supports for the mass are undergoing appreciable vibratory displacements. The kinetic property of bodies utilized in this connection is that which gives rise to the so-

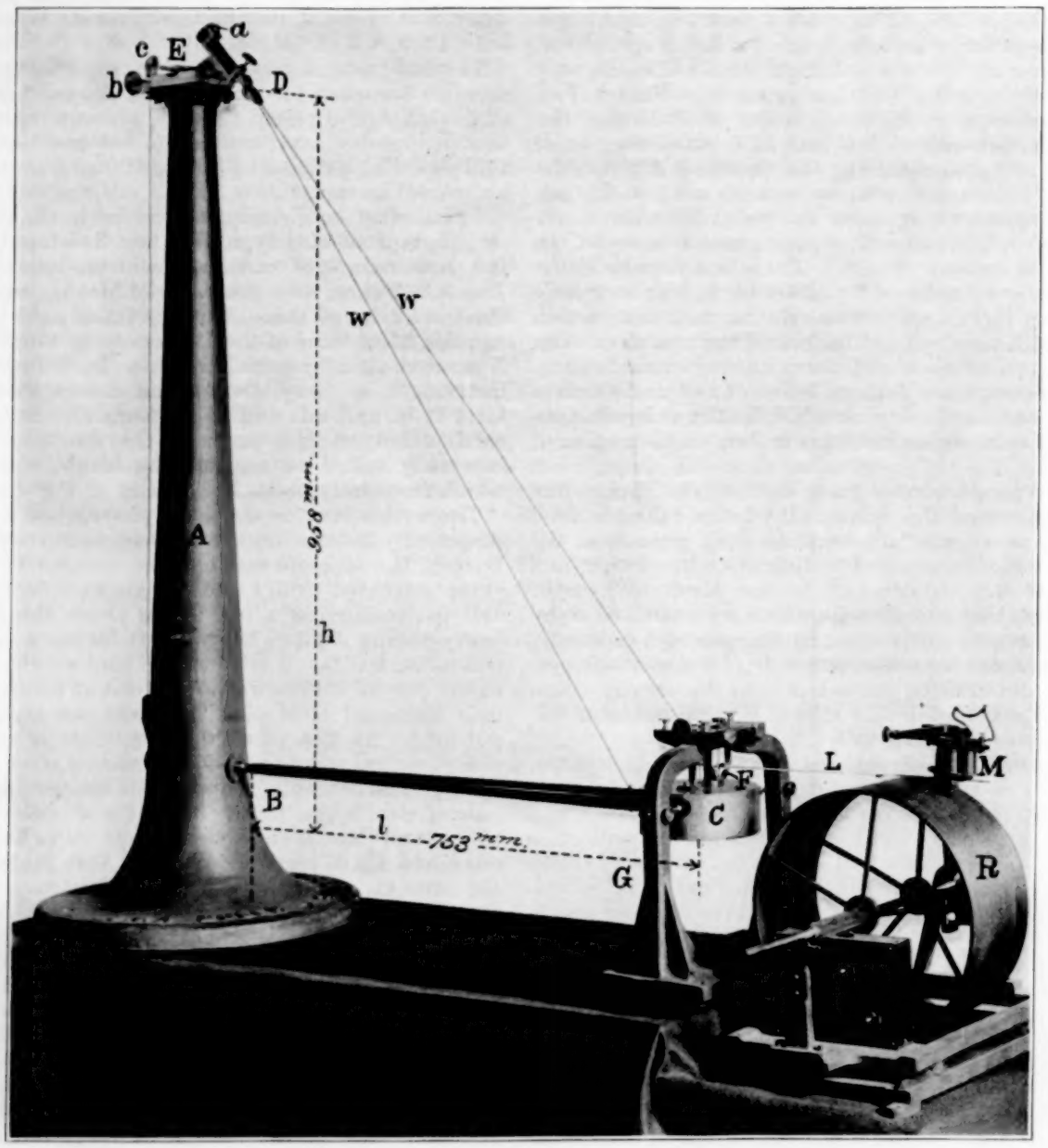

FIG. 1.

called *axis of instantaneous rotation*. Whenever any force is applied in a one-sided fashion to move a body all points of the body will not move in the same manner, in fact, one point, or a line of points, will actually remain sensibly at rest for small displacements. This point, in mechanics, is called the *axis of instantaneous rotation*, or *the center of percussion*.

In the case of the pendulum *B*, *C*, *D* nearly all the mass is concentrated at *C* and the result is that the axis of instantaneous rotation, or, as we shall call it, the steady line, is at a point very near the center of the mass *C*. Consequently whenever the support *A* is displaced horizontally with a vibratory motion, as in the case of an earthquake, the steady line of the mass *C* will remain at rest for all movements transverse to the plane *B*, *C*, *D*. Motion directly in the line of the strut is communicated, of course, to *C*, but the registering mechanism is so disposed that such motions produce no record whatever. Although the mass *C* is very largely displaced whenever the support *A* is tilted even in the slightest degree in a direction perpendicular to the plane *B*, *C*, *D*, results have nevertheless shown that tilting is not an appreciable feature in earthquake motion, except near the origin of the disturbance, or possibly in the case of large waves. We find then that the steady line of the mass *C* remains relatively stationary during an earthquake disturbance, and the manner of recording the movement of the earth with respect to this point is shown more in detail in fig. 2.

The magnifying and recording lever shown at *L* is made of very thin sheet aluminum bent into an inverted trough-shaped section to secure stiffness, and is provided with a conical pointed, hardened steel, axis, *d*, which is centered and carried in the stirrup *F* which, in turn, is adjustably but firmly attached to the heavy casting *C*. The short arm of the lever *L* is slotted and engages the slender staff *f* in the manner shown. The staff *f* is made of hardened steel, with conical pivot points centered in the stirrup *F'*, which is securely attached to the mass *C* in such a position that the center of the staff *f* lies in the prolongation of the steady line of the mass *C*.

The record is traced on a sheet of smoked paper wrapped around the large cylinder *R*, fig 1. In order that the friction may be reduced as far as practicable at the tracing point, the

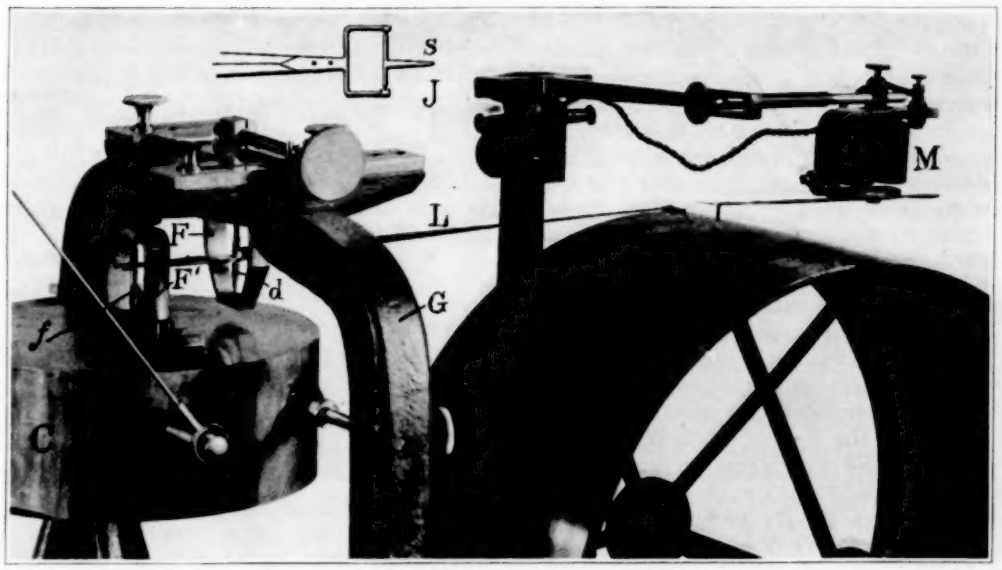

FIG. 2,

coating of soot is made relatively thin and a paper with a highly glazed surface is employed. Much depends also upon the tracing point which is a mere bit of steel, *s*, pivoted to the lever in the manner shown at *J*. The degree of magnification can be adjusted to suit by shifting the carrier or stirrup *F* so as to increase or shorten the distance between the staff *f* and the pivot *d*. Provision is made for a magnification of from 5 to 15 times. A 10-fold magnification seems to give about the best results for feeble earthquakes.

Every precaution must be taken in the construction and mounting of the lever *L* to satisfy the following conditions:

I.—To reduce the mass of the lever to the minimum without serious loss of stiffness and rigidity.

II.—To eliminate friction at the pivots and stylus to the least degree without perceptible shake or lost motion in the pivot points.

III.—To proportion the two arms of the lever so that its axis of instantaneous rotation shall fall at or near the point where the forked end engages the staff *f*. This requirement is of considerable importance if the lever *L* has much mass, but can generally be ignored by keeping the weight down to the lowest possible limit.

IV.—To eliminate every trace of looseness in the pivots and in the forked connection, but at the same time avoid friction.

The record cylinder *R*, fig. 1, is driven at the rate of one revolution per hour, and the axis at one end is cut with a steep screw-thread which shifts the cylinder endwise as it revolves. The stylus therefore traces a helical line on the drum, thus separating the successive portions of the record.

The mechanism at *M* is an electric time marker, the magnet of which is in connection with a circuit closer actuated by a high grade clock. The circuit is closed momentarily once each minute, and causes a finger to mark a time stroke each minute on the trace.

We hardly need to explain that when an earthquake occurs all the parts of the instrument partake of the motion of the earth except the steady line of the mass *C*. This remains relatively stationary in space for horizontal displacements perpendicular to *B C*. The lever *L*, at the point where it engages the staff *f*, likewise remains at rest, hence it follows that the stylus will trace on the drum a magnified record of the lateral displacements executed by the pivot *d;* that is by the ground supporting the instrument.

An example of a record of feeble earthquake is given in the MONTHLY WEATHER REVIEW for March, 1903, on page 126. Since that record was made the sensitiveness of the pendulum has been increased a little, that is, the points *B* and *D* have been brought still closer to the vertical line. The time of a complete vibration of the pendulum is now about twenty-five seconds. A simple pendulum that would vibrate in the same time would require to be nearly 693 feet long.

NOTES UPON THE THEORY AND USE OF THE PENDULUM.

The equation for the time of vibration of a horizontal pendulum is found as follows:

Let *l* equal distance from the axis of suspension to the center of oscillation of the pendulum considered as a simple pendulum. In other words let *l* be the radius of gyration of the mass with respect to the axis of suspension. Now as a simple pendulum the time of vibration will be:

$$t = 2\pi\sqrt{\frac{l}{g}}$$

where *g* is the acceleration due to gravity or whatever force

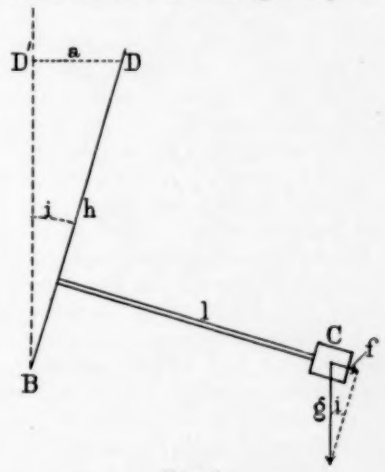

FIG. 3,

causes the pendulum to oscillate. In the case of a horizontal pendulum only a very small component, *f*, fig. 3, of gravity acts to produce the oscillation, hence the time of oscillation will be reduced in proportion. Thus we have $f = g \sin i$, and the time of a complete vibration is

$$T = 2\pi\sqrt{\frac{l}{g \sin i}}$$

from which

$$\sin i = \frac{4\pi^2 l}{g T^2}$$

which gives the angular inclination to the vertical of the axis of the pendulum corresponding to a given time of vibration T. If h is the linear distance between the two pivot point bearings of the pendulum, then the linear displacement of the upper point from the vertical line through the lower point (that is, $D D' = a$, fig. 3) will be

$$a = h \sin i = \frac{4\pi^2 h l}{g T^2}.$$

It is of great importance to investigate the effects of very small changes in the level on such a pendulum as that now under consideration. It is plain that such influences as variations in temperature, either in the iron column A, fig. 1, or the stone base, or any slight tiltings of the ground will produce changes in the position of the point D with respect to B, the result of which may cause the pendulum to wander from one position of rest to another whenever such changes occur.

Now, while the point D is very nearly vertically above the point B yet in general the distance $D D' = a$ is a magnitude of large order relative to the minute effects of temperature changes or the tiltings of the foundations due to ordinary influences. Thus, for example, in the Weather Bureau pendulum we have the following dimensions: $l = 753$ mm., $h = 958$ mm., $W = 11.4$ kilos. When $T = 25$ seconds, $a = 4.647$ mm. Whereas the displacements due to the influences mentioned are but a few hundredths of a millimeter in magnitude.

Let fig. 4 represent a diagramatic view of the pendulum and magnifying lever, as seen from the top. The point at D' is the end projection of the vertical line through the bottom pivot point B of the pendulum. C is the heavy mass and D is the top pivot.

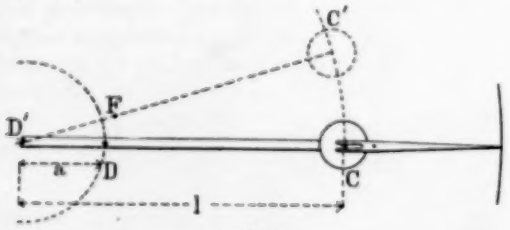

FIG. 4.

Let n = the ratio of the long to the short arm of the magnifying lever. If now we consider the pivot of the lever stationary and the pivot f, fig. 2, to move, then the tracing point will give a record of the displacement of f magnified n times. So likewise, as happens during an earthquake, if C and the pivot f remain at rest and the pivot d, fig. 2, moves with the earth, the magnification will still be n times, since the record sheet is itself displaced an amount equal to that of the pivot.

If now any of the influences mentioned causes a small displacement of the point D exactly in the direction of the line $D'\ C$, the only effect will be to alter the time of oscillation of the pendulum. A displacement in any other direction, however, as, for example, to F will not only modify the period, but will cause the pendulum to swing to a new position of rest in the azimuth $D'\ C'$. Inasmuch, however, as the distance $D\ D'$ is relatively large compared with the minute displacements we have in mind, the alteration they may produce in the period is of no consequence whatever and we are therefore now concerned only with the component of displacements perpendicular to the line $D'\ C$. We virtually assume that the displacement is tangent to the circle through D with center at D'.

Let ΔD be a small lateral displacement of the point D and let α be the corresponding angular change of the pendulum in azimuth; then $\tan \alpha = \frac{\Delta D}{a}$ and if d is the displacement on the record sheet then $d = n l \tan \alpha = \frac{\Delta D}{a} n l$ from which

$$\Delta D = \frac{a d}{n l}.$$

That is, the value of ΔD in linear measure is

$$\Delta D = \frac{4\pi^2 h}{g T^2 n} d.$$

If φ is the corresponding angular tilting of the ground its measure is

$$\sin \varphi = \frac{\Delta D}{h} = \frac{4\pi^2}{g n T^2} d. \qquad (1)$$

Since for the small angular magnitudes now under consideration, $\sin \varphi$ is proportional to φ we may write—

$$\sin \varphi = \varphi'' \sin 1'' = \frac{4\pi^2}{g n T^2} d$$

$$\therefore \varphi'' = \frac{4\pi^2 d}{g n T^2 \sin 1''}. \qquad (2)$$

In which φ'' = the angular displacement expressed in seconds of arc.

It is seen from the last equation that the sensitiveness to angular tilting depends entirely upon the time of vibration of the pendulum, so that two horizontal pendulums of the same time of vibration, but otherwise of different proportions are, nevertheless, equally sensitive to angular tilting of the vertical axis.

It is plain also that if the motion during an earthquake consists of tiltings rather than horizontal displacements the evaluation of the record must be made by means of equation (2).

With $n = 10$, $T = 25$ seconds, and d measured in millimeters.

$$\varphi'' = 0.1329\, d, \qquad (3)$$

$$\text{and } \Delta D = 0.0617\, d. \qquad (4)$$

Equations 3 and 4 give the numerical values of φ'' and ΔD for the Weather Bureau pendulum when the magnification is 10 and the period of vibration is twenty-five seconds. The extreme sensitiveness to tilting is exhibited in several ways. The weight of the observer almost anywhere on the floor of the small room in which the instrument is installed suffices to tilt the pendulum enough to show on the record, a large displacement is produced by standing at one side of the pedestal. It has been noticed also that the weight of an ice wagon which stops daily to deliver ice at a basement entrance to the building causes a definite displacement of the trace of about one millimeter which disappears when the wagon drives away. There are no vibrations or oscillations registered, only a distinct elastic bending of the ground due to the load. This motion, moreover, is communicated through the foundation walls of the building. The distance of the wagon from the seismograph is about 20 feet; the asphalted drive and the basement floor are on the same level. The subsoil is a hard clay.

It may be added that the road is a private driveway back of the building and is rarely used so that the effects and disturbances of the record due to its proximity are not regarded as interfering in the least with the validity of earthquake records.

Aside from transitory tiltings of the ground of the kind just discussed others of a more gradual character are also observed. If the pendulum were to remain absolutely stationary during twenty-four hours the record sheet would contain twenty-four straight parallel lines quite accurately spaced three millimeters apart.

The spacings are never exact, but are sometimes quite uniform. Generally, however, there is a distinct and progressive widening or narrowing of the spacings across the sheet, showing that a slow progressive tilting of the column or the ground has been in progress during the twenty-four hours in question.

While some of these displacements must be attributed to temperature changes and effects entirely within the instrument, yet slow tiltings of the ground also occur, due to a variety of causes. The seismograph, as now installed, answers every purpose for the registration of distinctively earthquake movements, but the slow tiltings referred to can not be studied satisfactorily in the present location of the apparatus which for such purposes should be isolated as far as practicable.

OBSERVATIONS OF SOLAR RADIATION WITH THE ANGSTROM PYRHELIOMETER, AT PROVIDENCE, R. I.[1]

By Mr. HARVEY N. DAVIS, dated March 9, 1903.

During the fall of 1901 arrangements were made by Prof. Cleveland Abbe, on behalf of the United States Weather Bureau, and Prof. Carl Barus, of Brown University, for making a series of observations upon the amount of solar radiation received from day to day at the surface of the earth. An Ångström electric compensation pyrheliometer, No. 28, and a Weston milliamperemeter, No. 4315, were accordingly sent to Providence, R. I., and the work placed in my hands.

As an observing station we finally decided upon a room in the third story of a house situated in one of the highest parts of the city. The galvanometer, resistances, and batteries were permanently fastened to the wall just inside a southern window, while the sloping roof outside offered a convenient and exposed support for the tripod and pyrheliometer. When in position the observing tube was about 188 feet above sea level.

As is already well known,[2] the instrument consists essentially of two thin narrow strips of blackened platinum so mounted as to be exposable to the sun's radiation. While one is thus exposed the other is shielded and heated to the same temperature by the passage of an electric current of known intensity (usually .2 to .4 amperes), the ammeter and a variable resistance being included in the circuit. The desired equality of temperature is recognized by means of a secondary thermo-electric circuit, including a very sensitive galvanometer of the D'Arsonval type, and a constanten-copper thermal element, whose junctions are very close to, but electrically insulated from, the centers of the two strips. At first the instrument was used with its electrical connections just as they were packed, but a considerable shifting of the zero point of the galvanometer soon appeared, and seemed to be due to a set in the torsion suspension, caused by the extreme deflections to which so sensitive an instrument is liable, before the current strength can be properly regulated. On this account I was led to introduce a platinum key into the galvanometer circuit and to use a zero method, adjusting the current in the main circuit until no throw was observable when the key was closed. This key was almost immediately replaced by a mercury commutator, symmetrical with respect to the galvanometer and pyrheliometer tube, to avoid any spurious thermal E. M. F. in the circuit. It was also found convenient to modify the connections of the main circuit for various reasons, until it assumed a form schematically represented in fig. 1. P is the tube, C the commutator, and G the galvanometer of the thermo-couple circuit. In the main circuit r is the variable resistance (which could be made ∞) and M the ammeter supplied with the apparatus. R is a resistance box of considerable size, which was used, partly to cut down the current on cloudy days, and partly to keep two Daniels' cells (B) in condition when the apparatus was not in use. T is a mercury three-way key.

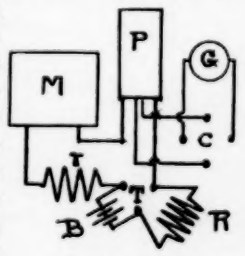

FIG. 1.

Early in December the behavior of the observing tube became very irregular, its resistance often becoming infinite for no apparent reason whatever. It was, therefore, returned to Washington and its contacts thoroughly examined, and, although no trouble could be found, the bad contact was in some way improved, for it functioned properly during the rest of the year.

During the summer of 1902 the writer was obliged to give up the work on account of his absence from the country, and Mr. Robinson Pierce, jr., also of Brown University, very kindly undertook it. The apparatus was moved to a similar situation at his home, a quarter of a mile away on the same ridge, the altitude of the tube being 163 feet. Here observations were made during July, August, and a part of September. Others were made later in September at the first place. Besides making these observations, Mr. Pierce has also carried through a considerable number of the calculations, whose results appear in the accompanying tables.

The method of observing was as follows: The tube was first set up and oriented, both strips being exposed to the sun, and the standard time, the neutral reading of the galvanometer (the key being open) and the temperature inside the tube were recorded. The "throw" when the key was closed was also observed, and both strips were exposed until this was a minimum, and usually very small. Two current determinations were then made, the first with the left-hand strip in the circuit and the second "switch right;" the tube's orientation was corrected; two more determinations were made, the first "switch right" and the second "switch left," and then the time, temperature, and zero point were again observed and recorded. The mean of four such current determinations was taken as the i of the set, corresponding to the mean time and the mean temperature. The total time necessary to complete a set was from four to eight minutes. The state of the sky was also recorded.

The sources of error to which such work is subject are very many. In the first place, a brisk breeze, if it were from the right direction and a bit gusty, was sometimes enough to cause a throw of 2 or 3 centimeters in a scale distance of some 50 centimeters, and the resulting error in the determination of radiation is 5 or 10 per cent. It is almost always possible, however, to take readings between times when the wind is gusty; when it is steady, the effect upon the mean i should be zero, so that this trouble is not particularly formidable if one does not care for accuracy within say 2 or 3 per cent. A further difficulty is caused, on all but the best days, by variations in the amount of heat absorbed by mists or clouds in the path of the sun's rays. If the cloud layers are at all thick, the resulting fluctuations in the radiation received are so considerable and so rapid that anything but the roughest kind of an approximation is at once impossible and meaningless. The presence of either of these difficulties is indicated in the accompanying tables by the words "readings variable," and when a full set of four determinations could not be obtained the resulting radiation number is marked with (?).

INVESTIGATION OF INSTRUMENTAL ERRORS.

Besides these meteorological troubles there were also instrumental ones to be reckoned with. The most obvious of these was a scale error in the ammeter, the pointer of which quite evidently read some 0.008 amperes too low when the instrument was first received. It was accordingly connected in series with a Thomson current balance, No. 134, a variable re-

[1] A similar report by Mr. H. H. Kimball will follow.—ED.

[2] See Prof. C. F. Marvin: "The measurement of sunshine and the preliminary examination of Ångström's pyrheliometer," MONTHLY WEATHER REVIEW, October, 1901.

See also Knut Ångström, Intensité de la Radiation Solaire—Recherches faites à Ténériffe, 1895 et 1896. Upsal, 1900.

See also K. Ångström, Nova Acta Upsal, 1893: The Physical Review, I, p. 365, 1893; Wied. Ann. 67, p. 636, 1899; Astrophysical Journal, 9, p. 334, 1899, and Annalen der Physik und Chemie, Neue Folge, Band 67 [1899], p. 633.

sistance (that supplied with the apparatus), and from one to fifteen cells of a large storage battery in the Brown laboratory, and several sets of comparisons were made covering the whole scale. In all, except the first few, the pointer of the ammeter was brought by means of the resistance exactly over a chosen scale division, which could be done with great accuracy, and the current balance was then adjusted and read to the nearest tenth of the smallest division of its accurate scale, the results being reduced by means of the tables supplied with the instrument and being accurate to within considerably less than one thousandth of an ampere, beyond which it was impossible to read the ammeter in actual use. Tenths of this unit were carried in the calculations although they could not be depended on as more than approximate. From a number of such observations made on November 18, 25, 26, and 27, 1901, it was at once evident that the trouble was not due to a bent pointer, for at 500 the error was practically zero; and further, that the correction curve, $x =$ a scale reading, $y =$ the corresponding correction, was by no means a straight line. Indeed, it was much more nearly two straight lines, and the break, as also an irregularity in the neighborhood of $x = 100$, were very probably not imaginary. In view of all this, we constructed an arbitrary table of corrections in thousandths of an ampere for each fiftieth division of the scale and interpolated when necessary. Each mean, i, was then corrected accordingly. At the same time it was noticed that when the ammeter was held vertically instead of horizontally the scale correction at zero was almost null, and so the instrument was investigated in this position, but it was found that although it was all right at both ends of the scale, yet in the middle it was just as bad in the one case as in the other, the new curve rising to the breaking point of the old one, with a similar irregularity at $x = 100$, and following the old curve almost exactly thereafter. Apparently the trouble was at least partly due to a poorly balanced shuttle. Still, the correction curve was quite definite and permanent, and so we concluded not to wait for repairs to the ammeter. The instrument was again thoroughly tested in April, 1902, and the curve obtained was essentially similar and showed the same two peculiarities. The various series of comparisons are shown in Table 1, as also the resulting table of corrections. The curves obtained are shown in fig. 2.

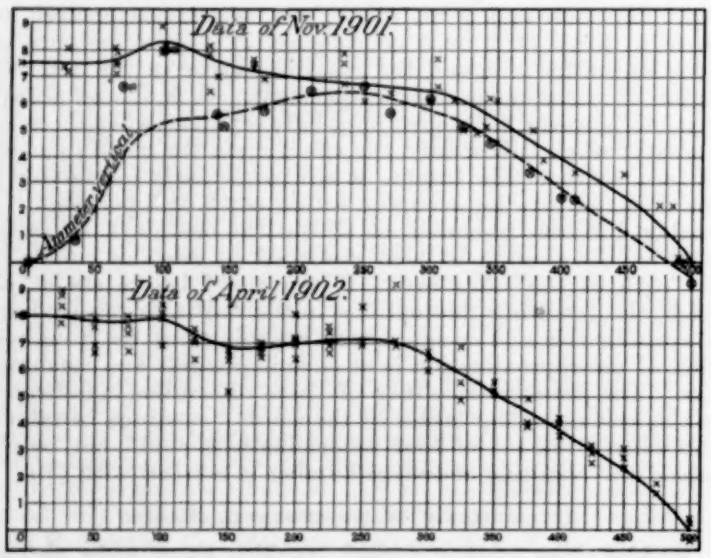

FIG. 2.

The peculiarities of the pyrheliometer itself were not so easily investigated. In the first place it was very early noticed that the current required to bring into equilibrium strip L, (the left hand strip, as one looks at the back of the tube) was, in general, considerably higher than the corresponding figures for strip R, under the same conditions. All the sets which were obtained in 1902, under favorable meteorological conditions, have been examined with this in view. If we call the four readings of a set, in their order A, B, C, and D (A and D being taken with the current through L), then the quantity $L - R = \frac{A+D}{2} - \frac{B+C}{2}$ was found to have an average value of + 22.6 thousandths of an ampere, and it was negative in only five sets in a total of 232. The cause of this is still obscure. Of course such a discrepancy would arise if the strips were dissimilar in width, absorbing power, or specific resistance; but, as a matter of fact, the actual difference in width is far too small to account for the observed effect, and probably the same is true as to the other constants of the strips. Furthermore, during the last twenty observations an especial effort was made to work very slowly, from seven to thirteen minutes being used for a set of four readings, with the unexpected result that this quantity $L - R$, previously consistently

TABLE 1.—*Comparison of milliamperemeter No. 4315 with Thomson current balance No. 134.*

1901.

Scale reading.	Nov. 18.	November 25.			Scale reading.	Nov. 26.	Nov. 27, vertical	Adopted corrections (used up to April 26).	
	I.	II.	III.	IV.		V.	VI.		
	Correction.	Correction.	Correction.	Correction.		Correction.	Correction.	Scale reading.	Correction.
28	+10.4*	+12.0*	+8.1	+7.2	− 7.5	+7.5	.....	0	+8
64	7.5	8.1	7.5	7.1	0	.....	0.0	50	8
98	.....	8.8	8.0	+7.9	26	7.3	.....	100	8
134	6.4	8.2	7.8		35	.....	+0.7	150	7
167	7.3	7.4	7.6		65	7.9	.....	200	7
236	6.7	7.8	+7.5		70	.....	6.7†	250	6
306	6.6	7.7			100	8.1	8.1†	300	6
319	.....	6.1			140	7.0	5.6	350	5
342	5.1	.....			145	.....	5.2	400	4
345	.....	6.2			175	6.9	5.7	450	+2
350	.....	6.1			210	6.6	6.6	500	0
377	5.0	.....			250	6.1	6.7		
448	.....	3.3			270	6.3	5.7		
475	.....	+ 2.1			300	6.1	6.2		
483	+ 2.1	.....			325	5.0	5.2		
					335	4.9	.....		
					345	.....	4.5		
					350	4.5	.....		
					375	.....	3.3		
					385	3.8	.....		
					400	.....	2.4		
					410	3.4	2.3		
					490	+0.2	−0.1		
					495	0.0	.....		
					500	−0.1	−0.8		

NOTE.—Sets I, II, V, and VI were made with the medium weights on the balance. As thus used the balance has a range of .5 amperes, just that of the ammeter. Set III was made with the small set of weights and set IV without any weights at all.

*In the least sensitive part of the scale.

†Known to be too large. Pointer did not swing clear.

1902.

Scale reading.	April 25.	April 26.		April 28.		Adopted corrections (used after Apr. 26).	
	I.	II.		III.			
	Correction.	Correction.		Correction.		Scale reading.	Correction.
				(Up.)	(Down.)		
− 8	+8.0	+8.0		+8.8	+7.7	− 8	+8.0
+ 25	9.0	8.4		7.9	6.8	+ 25	8.5
50	7.6	6.6		7.6	7.4	50	7.2
65	8.0	6.7		7.8	8.1	75	7.6
100	8.4	6.8		7.2	7.0	100	8.0
125	7.5	6.3		6.3	6.6	125	7.0
150	6.7	5.2		6·5	6.8	150	6.4
175	7.0	6.7		6.9	7.2	175	6.7
200	7.2	6.4	+8.2	6.6	7.4	200	7.0
225	7.6	6.8	7.1			225	7.2
250	7.0	8.3	6.9			250	7.4
275	6.9	9.3	7.0			275	7.4
300	6.5	6.7	5.9			300	6.8
325	4.7	4.7	6.8			325	5.8
350	5.2	5.5	5.1			350	4.8
375	4.8	4.0	3.8			375	4.2
400	3.5	4.0	4.1			400	3.8
425	2.8	3.2	2.5			425	2.8
450	2.4	2.7	3.0			450	2.7
475	+1.3	1.7	1.3			475	+1.5
500	−0.3	+0.4	+0.3			500	0.0

Sets I and II with the medium weights; set III with the small weights.

large, was reduced to + 9.8 thousandths of an ampere. It is, however, to be hoped that the individual errors in *A*, *B*, *C*, and *D* are largely eliminated in an arithmetic mean.

Another noticeable peculiarity was a sort of rhythm in the relative magnitudes of *A*, *B*, *C*, and *D*, *D* being almost invariably larger than *A*, and *B* than *C*. On the average, *A* was found to be 7.2 thousandths amperes greater than the mean of the four, *B* to be 9.4 and *C* 14.1 less than that mean, and *D* 16.4 greater, as is indicated in fig. 3. With this in

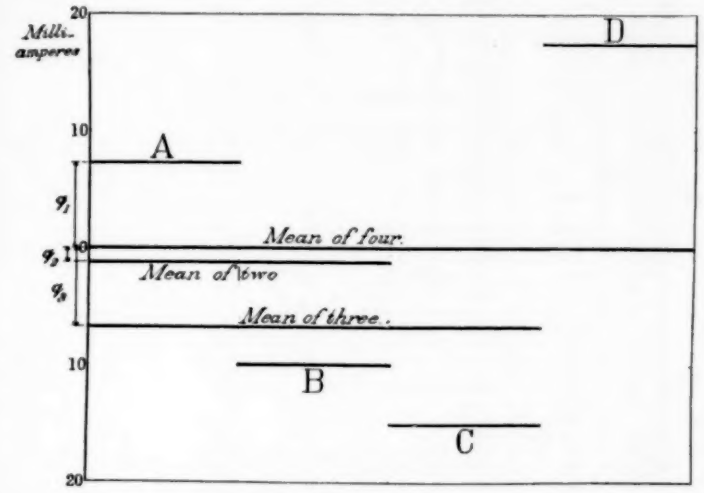

FIG. 3.

view, a careful record was kept during September of the direction and amount of the throw obtainable with both strips exposed just after each of the four determinations of a set. Almost invariably the strip which had just been heated by the current showed an excess of temperature, and this is probably the true cause of the shifting of the galvanometer zero, rather than any trouble in the suspension. This throw may be due merely to a difference in rates of cooling, in which case each determination, having been made by a zero method, would be correct; or it may be due to some cumulative action of the current either on the strips or on the thermal circuit, in which case each reading would be too high. In either case, if the four readings were made too close together, we should expect *B* and *D* to be too high and *C* too low, thus explaining the inequalities which have been mentioned, but we should not expect the mean of *C* and *D* to be higher than that of *A* and *B*, while, as a matter of fact, it averaged 2.3 thousandths amperes higher. The whole thing is so complicated that, until a satisfactory explanation of it is worked out, the arithmetic mean of the four determinations of a set must be regarded as the safest thing to work with, the results thus obtained being at least consistent. I have, however, obtained the average differences for each month, which are presented in Table 2, and from the weighted means of these averages have computed a set of corrections for the reduction of the mean of a defective set to "standard conditions," as follows:

$$q_1 = \text{mean} - A = -7.2;$$

$$q_2 = \text{mean} - \frac{A+B}{2} = +3.5;$$

$$q_3 = \text{mean} - \frac{A+B+C}{3} = +5.9.$$

I have also tried to get some idea of the consistency with which observations could be made by computing for each standard set the quantity $E = \frac{A+B}{2} - \frac{C+D}{2}$. The algebraic mean of these is $E = -2.3$ thousandths amperes, and the mean of their numerical values without regard to sign is $[E] = 5.5$ thousandths amperes. The "mean of the errors," in the least squares sense would be $\eta = \frac{[E]}{2} = 2.8$, which would give a probable error of 2.4, rather less than 1 per cent of the average reading. With experience and plenty of time between readings one could easily keep the probable error, *as thus calculated*, under one-half of 1 per cent; but, unfortunately, this does not mean very much. I do believe, however, that such observations can be relied upon within 3 or 4 per cent and that, for qualitative meteorological work, such an amount of accuracy is quite enough to make them of value.

TABLE 2.

Month.	Observer.	Number of observa'ns.	Values for $L-R$.	No. of obs. with neg. $L-R$.	Mean $-A$.	Mean $-B$.	Mean $-C$.	Mean $-D$.	E.	$[E]$.
January.....	H. N. D.	42	13.8	2	— 5.3	7.7	9.8	—13.1	—3.0	4.9
February	do.	23	29.2	1	—10.4	10.5	17.7	—19.1	—0.8	5.0
March.....	do.	29	33.0	0	—10.0	13.4	19.9	—23.5	—3.6	4.4
April.....	do.	12	17.7	1	— 4.8	4.8	12.9	—12.9	—0.1	6.4
May.....	do.	9	23.2	0	— 3.7	7.5	13.6	—23.5	—6.1	6.1
June.....	do.	6	29.5	0	— 8.8	13.2	21.0	—25.5	—4.5	5.8
July.....	R. P., jr	40	20.7	0	— 7.9	8.3	12.6	—12.9	—0.4	6.0
August.....	do.	40	28.0	0	— 7.0	11.4	16.8	—21.1	—4.1	6.5
September	do.	12	24.9	0	— 5.6	9.8	15.0	—19.4	—4.4	5.4
*September...	H. N. D.	19	9.8	1	— 6.4	4.1	6.1	— 3.7	+2.2	4.3
Totals.....	.....	232	.....	5	.....	.....	.....	.....	.....	.....
Weighted means.....	.....		22.6	.....	— 7.2	9.4	14.1	—16.4	—2.3	5.5
Excluding *September.....	.....		23.7	.....	— 7.2	9.9	14.9	—17.5	—2.7	5.5

RECORD OF OBSERVATIONS OF SOLAR RADIATION.

The determinations made, 267 in number, are presented in Table 3. The first column gives the date, and the second the local solar time *T* of each observation. In the third are the determinations themselves or *Q* in gram calories per minute and per square centimeter; these are calculated from the corrected means (*i*) of the currents observed, by Ångström's formula[3]

$$Q = \frac{r\,i^2}{4.19\,.\,a\,.\,b}\,60 = k\,i^2$$

where *r* is the resistance per linear centimeter of the bands, *b* their width and *a* their absorbing power. The only one of these instrumental constants that could be verified was *b*, given as 0.150 cms. Direct measurements with a filar micrometer gave—

Right-hand band $b = 0.1482$ cm.
Left-hand band $b = 0.1493$ cm.
Average.... $b = 0.1488$ cm.

the discrepancy being quite negligible. In practise the factor *k* for any temperature was taken from the table given by Ångström. The figures in the fourth column *N* indicate the number of readings upon which the corresponding *Q* is based; in the absence of any figure, 4 (a normal set) is to be understood.

In the next three columns are the hour angle θ, the declination δ, and the zenith distance *z* of the sun. For δ the mean value for each day is used; a more accurate interpolation would have increased the labor of the subsequent computation very materially, while the improvement in the values of *z* would have been but slight. θ and *z* are calculated for each observation, the former from *T*, the latter by the formula

$$\cos z = \sin\theta \sin\delta + \cos\varphi \cos\delta \cos\theta$$

the results being given to the nearest five minutes.[4] φ was taken as 41° 50.′.

The remaining five columns give the accompanying meteorological conditions. Two sets of data were available, those taken at the Ladd Observatory under the direction of Profes-

[3] See Ångström's Teneriffe report, p. 7.

[4] For a graphical method of solving this equation for a large number of observations by means of a steorographic projection of the celestial sphere, see Radau Actinométrie. Paris, 1877, p. 31.

TABLE 3.—*Observations of solar radiation.*

Date.	*T.*	*Q.*	*N.*	ϑ.	δ.	*Z.*	Barometer.	Temperature.	Relative humidity.	Absolute humidity.	Weather.
1901.	*h. m.*			° ′	(South.) ° ′	° ′	*Inches.*	° *F.*	*Per cent.*	*Grs. cu. ft.*	
November 5	12:31	1.062	(?) 6	7 45	15 37	57 50	29.87	50	60	2.446	Cloudy.
6	12:26	0.310	.....	6 30	15 55	58 05	.86	46	65	2.300	Cloudy; readings variable.
9	10:46	0.897	.....	18 30	16 48	61 05	.88	49	58	2.346	
	12:42	0.643	.....	10 30	.....	59 25	.83	51	42	1.773	
	1:31	0.795	.....	22 45	.....	62 15	.82	50	45	1.834	
11	1:42	0.131	(?) 3	25 30	17 22	63 45	.96	43	38	1.271	
15	10:00	0.848	.....	30 00	18 26	66 20	.36	40	60	1.709	
16	11:41	1.014	.....	4 45	18 42	60 40	.57	45	50	1.707	Light clouds near horizon.
	11:48	1.078	.....	3 00	.....	60 35	.57	45	50	1.707	
	12:05	1.059	.....	1 15	.....	60 35	.57	45	50	1.707	
	12:31	1.043	8	7 45	.....	60 55	.57	45	48	1.640	
21	12:56	1.143	.....	14 00	19 53	63 05	30.05	40	52	1.632	
30	12:38	0.995	.....	9 30	21 37	64 05	29.76	34	55	1.254	Hazy clouds near horizon.
	12:51	1.000	.....	12 45	.....	64 30	.77	34	55	1.254	
December 4	9:26	0.868	12	38 30	22 13	73 15	.57	23	96	1.362	Streaky clouds near horizon.
	2:47	0.842	6	41 45	.....	74 45	.67	25	60	0.931	
5	9:00	0.656	.....	45 00	22 21	76 30	.97	23	71	1.007	
	2:38	0.746	(?) 2	39 30	.....	73 50	.97	24	51	0.757	
6	9:02	0.841	10	44 30	22 29	76 20	30.22	23	59	0.837	
1902.											
January 12	9:22	0.866	12	39 30	21 43	73 20	29.01	25	73	1.132	Hazy, some cirrus.
	10:31	1.025	8	22 15	.....	66 50	.00	27	68	1.154	
	12:51	1.055	12	12 45	.....	64 40	28.98	29	59	1.093	
	2:36	0.766	(?) 1	39 00	.....	73 05	29.02	29	57	1.055	Cumuli.
13	8:41	0.346	.....	49 45	21 33	78 20	.34	24	68	1.007	Fleecy haze.
	10:24	0.184	.....	24 00	.....	67 10	.35	22	63	0.854	Heavy haze.
	12:23	0.586	8	5 45	.....	63 35	.34	24	58	0.860	Do.
	3:22	0.607	.....	50 30	.....	78 40	.36	25	57	0.884	Do.
14	8:37	0.725	6	50 45	21 23	78 40	.74	16	62	0.640	
	11:01	1.179	8	14 45	.....	64 40	.78	23	44	0.623	
	12:19	1.160	8	4 45	.....	63 20	.76	24	40	0.593	Very light haze.
	1:21	1.125	.....	20 15	.....	65 55	.76	25	37	0.573	
	2:58	0.954	8	44 30	.....	75 25	.78	27	35	0.544	
15	8:52	0.577	8	47 00	21 12	76 35	.80	28	90	1.596	
	10:37	0.737	8	20 45	.....	65 55	.78	37	74	1.837	Hazy clouds; readings variable.
16	9:57	0.321	.....	30 45	21 01	69 00	.63	34	80	1.823	Heavy haze.
	2:50	0.553	8	44 45	.....	75 15	.54	38	59	1.561	
17	8:50	0.503	.....	47 30	20 50	76 30	.61	20	65	0.803	Fleecy clouds; readings variable.
	1:33	1.132	(?) 1	23 15	.....	66 15	.60	28	48	0.851	Fine blue sky; instrument working poorly.
19	10:38	0.938	.....	20 30	20 26	65 05	.74	36	60	1.474	Very light haze.
20	8:45	0.931	8	48 45	20 13	76 40	30.16	20	55	0.680	Fine sky.
	12:52	0.480	8	13 0	.....	63 10	.12	31	50	1.011	Light streaky clouds.
25	8:29	0.856	8	52 45	19 04	78 05	.04	28	70	1.241	Light cirrus under the sun.
	10:34	1.085	8	21 30	.....	64 05	.08	34	47	1.071	
	11:04	1.103	.....	14 0	.....	62 15	.07	34	46	1.049	Light haze.
	1:43	0.640	.....	25 45	.....	65 25	.07	36	50	1.228	
	3:00	0.524	8	45 0	.....	73 45	.10	36	50	1.228	
28	8:34	0.914	8	51 30	18 19	76 40	.24	17	40	0.432	
	1:40	1.166	8	25 0	.....	64 25	.24	20	39	0.482	
February 3	1:46	1.054	.....	26 30	16 39	63 25	29.23	29	41	0.760	Haze; few cumuli; wind.
	4:05	0.453	(?) 1	61 15	.....	81 15	.32	28	40	0.709	Cumuli.
4	8:34	0.703	.....	51 30	16 21	75 05	.57	16	61	0.632	Streaky haze.
5	8:45	0.785	.....	48 45	16 03	73 15	.67	14	67	0.630	Haze along horizon.
	3:39	0.591	8	54 45	.....	76 45	.72	22	46	0.624	
6	11:13	1.128	.....	11 45	15 45	58 35	.83	23	46	0.651	Haze.
7	8:42	0.594	.....	49 30	15 26	73 10	.62	21	60	0.776	
8	1:39	0.467	.....	24 45	15 08	61 25	.16	23	50	0.709	Cumuli; dust; readings variable.
9	1:43	1.150	.....	25 45	14 48	61 25	.19	36	50	1.228	Fine sky.
10	3:49	0.837	.....	57 15	14 29	77 05	.40	36	46	1.130	Do.
11	8:20	0.844	.....	55 0	14 10	75 25	.56	16	61	0.632	Do.
	8:48	0.929	.....	48 0	.....	71 20	.56	17	57	0.615	Do.
	11:57	1.183	.....	0 45	.....	56 00	.54	23	44	0.625	Do.
13	1:36	1.108	.....	24 0	13 30	59 35	.52	33	40	0.878	
	2:46	0.981	.....	41 30	.....	67 15	.52	33	37	0.812	Stratus near horizon.
14	8:53	1.008	.....	46 45	13 10	69 50	.78	27	70	1.188	Blue sky; haze very light.
	11:07	1.162	.....	13 15	.....	56 20	.79	33	59	1.294	
	11:47	1.132	.....	3 15	.....	55 05	.77	35	55	1.302	Very blue sky.
	1:35	1.175	.....	23 45	.....	59 10	.75	37	45	1.148	Traces of haze under sun.
	2:51	1.074	.....	42 45	.....	67 35	.74	38	43	1.135	Light haze under sun.
15	12:00	0.955	(?) 1	00 00	12 49	29 00	.86	37	27	0.688	Clouds over sun; readings variable.
19	2:53	1.043	.....	43 15	11 26	66 25	.44	25	54	0.838	Light haze; wind.
	4:17	0.751	.....	64 15	.....	79 20	.49	26	54	0.876	
20	11:45	1.186	.....	3 45	11 04	53 00	.91	32	50	1.056	Fine sky.
23	10:38	1.182	.....	20 30	9 59	55 10	.74	27	54	0.916	Blue sky.
25	11:43	0.966	.....	4 15	9 15	51 15	.89	39	98	2.689	Cloudy all day; readings variable.
27	2:28	0.369	.....	37 0	8 30	60 40	.57	46	79	2.796	Through clouds; readings variable.
March 1	9:58	0.454	(?) 3	30 30	7 45	56 55	.50	48	86	3.144	Cirrus; stratus over sun; readings variable.
	2:33	0.703	.....	38 15	.....	60 40	.48	47	(?) 65	(?) 2.383	Haze and small cumuli.
4	8:36	0.921	.....	51 0	6 36	67 05	.56	33	62	1.360	Light haze; small cumuli.
6	2:36	1.157	.....	39 0	5 50	59 25	.68	35	44	1.042	Fine sky.
	4:37	0.737	.....	69 15	.....	78 45	.76	35	42	0.904	Do.
7	8:29	0.713	.....	52 45	D 27	67 20	30.01	33	60	1.316	Morning haze light.
	8:50	0.718	.....	47 30	.....	64 00	.01	34	57	1.298	
	10:22	0.933	.....	24 30	.....	52 20	.00	40	54	1.538	Sun slightly hazy.
	11:08	0.971	.....	13 00	.....	48 45	.00	41	53	1.567	Light clouds; sun clear.
	12:42	0.988	.....	10 30	.....	48 15	29.97	44	50	1.647	Cirro-stratus over sun.
8	11:03	0.163	.....	14 15	5 03	48 40	30.23	42	79	2.727	Clouds; readings very variable.
10	9:40	1.022	.....	35 0	4 17	56 00	29.83	41	63	1.859	Small cumuli.
	11:57	1.098	.....	0 45	.....	46 15	.85	43	56	1.778	Small cumuli in a fine sky.
	2:02	1.122	.....	39 30	.....	53 50	.87	44	52	1.713	Fine sky.
11	2:49	0.853	.....	42 15	3 53	59 40	30.06	39	85	2.334	Fleecy clouds.
	4:29	0.175	.....	67 15	.....	76 00	.04	38	87	2.302	
14	10:05	1.226	.....	28 45	2 42	51 35	29.98	38	41	1.084	Fine sky.
	3:23	1.190	.....	50 45	.....	63 55	30.07	41	35	1.034	Do.
15	12:05	1.363	.....	1 15	2 19	44 10	.25	46	56	1.983	Cirrus near horizon; wind.
18	10:02	1.175	.....	29 30	1 08	50 35	29.74	36	40	0.983	Fine sky; traces of low haze.
	11:18	1.213	.....	10 30	.....	44 0	.72	37	39	0.994	Fine sky.
	11:56	1.207	.....	1 0	.....	43 0	.72	39	38	1.043	Do.
	12:57	1.183	.....	14 15	.....	44 50	.70	39	38	1.043	Few scattered clouds.
					(North.)						
23	2:06	1.246	.....	31 30	0 51	49 50	.67	60	39	2.241	Blue sky; many cumuli.
24	8:46	1.181	.....	48 30	1 15	59 30	.73	46	56	1.983	Fine sky.
	10:42	1.265	.....	19 30	.....	44 15	.72	47	50	1.834	Big cumuli; sun clear.
	12:36	1.328	.....	9 0	.....	41 25	.70	48	43	1.634	Small cumuli; sun clear.
25	1:57	1.177	.....	29 15	1 38	48 00	.85	48	47	1.786	Light stratus; sun nearly clear.

TABLE 3.—*Observations of solar radiation*—Continued.

Date.	*T.*	*Q.*	*N.*	ϑ.	δ.	*Z.*	Barometer.	Temperature.	Relative humidity.	Absolute humidity.	Weather.
1902.	*h. m.*			° ′	(South.) ° ′	° ′	*Inches.*	° *F.*	*Per cent.*	*Grs. cu. ft.*	
March 25	5:13	0.601	.....	78 15	.....	80 10	.87	45	51	1.741	Good sky.
26	1:14	1.183	.....	18 30	2 02	43 10	30.04	46	55	1.593	
31	10:57	1.213	.....	15 45	3 59	40 25	29.21	51	46	1.943	Cumuli; sun clear.
April 1	3:07	0.549	(?) 1	46 45	4 22	55 55	.08	48	38	1.444	Cumuli; readings variable.
6	10:02	1.039	(?) 1	29 30	6 17	44 10	.73	52	46	1.573	Light clouds; batteries bad.
15	12:39	1.270	.....	9 45	9 36	33 20	.84	51	37	1.563	Fine sky.
	2:30	1.195	.....	37 30	.....	46 05	.81	55	34	1.653	Do.
17	9:09	1.034	.....	42 45	10 19	48 50	.74	50	46	1.874	Heavy haze near horizon.
19	10:34	1.131	.....	21 30	11 01	36 05	.85	54	40	1.874	Uniform haze.
	11:44	1.063	.....	4 0	.....	31 00	.83	54	38	1.780	Streaky haze.
	1:06	1.096	.....	16 30	.....	34 00	.82	55	35	1.698	Bluish haze.
	2:59	1.016	.....	44 45	.....	49 40	.81	53	51	2.308	Uniform haze.
	4:43	0.718	.....	70 45	.....	68 20	.81	51	60	2.533	Haze.
	5:35	0.357	.....	83 45	.....	78 05	.82	50	70	2.853	Do.
20	3:18	0.691	.....	49 30	11 22	52 45	.80	53	71	3.213	Haze; few cumuli.
21	11:14	0.575	.....	11 30	11 42	31 45	.83	58	57	3.060	
23	12:06	1.117	(?) 2	1 30	12 23	29 30	.64	56	73	3.661	Clouds; readings very variable.
25	8:36	1.108	.....	51 0	13 02	32 35	30.03	48	52	1.976	Light fleecy haze.
	12:27	1.022	.....	6 45	.....	29 25	29.99	53	54	2.403	Light cirrus.
28	3:45	0.882	.....	56 15	14 0	35 45	.84	68	29	2.169	Cumulo-stratus.
May 2	9:00	1.145	.....	45 0	15 14	46 50	.90	55	58	2.812	
4	10:23	1.237	.....	24 15	15 50	33 20	.98	57	51	2.648	Fine sky.
6	9:12	1.207	.....	42 0	16 24	44 00	.93	59	36	1.908	Do.
	2:37	0.597	(?) 1	39 15	.....	47 55	.88	59	66	3.666	Cloud over sun.
10	3:03	0.768	.....	45 45	17 30	45 50	.80	50	35	1.427	Haze.
11	12:35	1.302	.....	8 45	17 46	25 10	.93	56	32	1.605	Fine sky.
16	12:17	1.148	(?) 1	4 15	18 59	23 05	.85	63	35	2.223	Few fleecy cumuli; batteries bad.
18	1:20	1.020	.....	20 0	19 27	28 05	.73	69	40	3.090	Hazy.
23	10:54	1.033	.....	16 30	20 29	25 30	.67	78	54	5.550	Very light cirrus; oppressively hot.
31	9:03	1.170	.....	44 15	21 51	42 00	30.18	58	50	2.685	Blue sky.
	2:10	1.210	.....	32 30	.....	33 45	.17	68	34	2.544	
June 1	11:30	1.159	.....	7 30	22 0	20 50	.23	65	59	4.001	Bluish white sky.
5	11:30	1.191	.....	7 30	22 30	20 20	29.84	61	55	3.268	Blue sky; small cumuli.
9	9:58	1.251	.....	30 30	22 54	31 40	.72	59	50	2.778	Blue sky; light haze near horizon.
11	8:00	1.092	.....	60 0	23 03	52 50	.72	56	65	3.261	Bluish sky; heavy haze near horizon.
	10:08	1.158	.....	28 0	.....	29 55	.72	59	58	3.242	Do.
24	11:50	1.240	.....	2 30	23 26	18 30	.75	63	53	3.364	Cumuli.
July 4	12:02	1.173	.....	0 30	22 56	18 55	.75	70	44	3.512	Cumuli (2).
5	3:36	0.928	.....	54 0	22 51	48 30	.65	71	48	3.956	Fleecy stratus (1).
	4:52	0.771	.....	73 0	.....	62 00	.64	73	44	3.825	Stratus (1); light haze over sun.
9	8:41	0.743	.....	49 45	22 26	45 35	.78	77	70	6.973	Cirrus (3); haze over sun.
11	8:44	1.136	(?) 1	49 00	22 11	45 10	.83	67	57	4.128	Batteries bad.
12	8:57	0.832	.....	45 45	22 03	42 55	.86	72	50	4.254	Cirro-cumulus near sun.
	11:30	1.098	.....	7 30	.....	20 45	.83	76	40	3.862	Cumuli (4).
	12:21	1.139	(?) 1	5 15	.....	20 15	.82	77	38	3.786	Cumuli (5); batteries bad.
13	7:02	0.765	.....	74 30	21 55	64 20	.77	67	89	6.474	Blue sky; some haze.
	7:27	0.825	.....	68 15	.....	59 40	.78	74	86	7.795	Blue sky; haze over sun.
	8:00	0.889	.....	60 0	.....	53 30	.79	70	75	5.985	Do.
	8:32	0.949	.....	52 0	.....	47 35	.80	72	65	5.531	Blue sky; few cumuli in southeast.
	9:01	1.016	.....	44 45	.....	42 15	.80	73	60	5.269	White haze up to sun.
	9:44	1.067	.....	34 0	.....	34 40	.80	74	50	4.533	Clear sky.
	10:32	1.134	.....	22 0	.....	27 20	.80	76	48	4.634	Perfectly clear.
	11:07	1.116	.....	13 15	.....	22 50	.80	76	47	4.537	Do.
	12:04	1.137	.....	1 0	.....	19 55	.78	78	44	4.523	Do.
	12:53	1.082	.....	13 15	.....	22 50	.78	80	40	4.374	Very few small cumuli.
	1:40	1.118	.....	25 0	.....	28 55	.77	81	38	4.284	Do.
	2:20	1.136	.....	35 0	.....	35 25	.76	81	37	4.171	Do.
	2:56	1.082	.....	44 0	.....	41 45	.76	81	37	4.171	Do.
	3:34	1.035	.....	53 30	.....	48 40	.75	82	38	4.418	Light haze.
	4:13	0.860	.....	63 15	.....	55 55	.75	82	37	4.302	Haze over sun; readings variable.
	4:56	0.918	.....	74 0	.....	63 55	.74	82	37	4.302	Haze in west.
14	7:01	0.629	.....	74 45	21 46	64 35	.79	71	82	6.756	Heavy haze.
	7:52	0.832	.....	62 0	.....	56 05	.80	74	71	6.437	Do.
	8:53	0.939	.....	46 45	.....	43 50	.80	79	55	5.830	
	11:25	1.100	.....	8 45	.....	21 20	.77	83	47	5.634	Clear sky; breeze.
	12:14	1.106	.....	3 30	.....	20 15	.75	84	48	5.930	
	12:54	1.042	.....	13 30	.....	23 05	.74	85	46	5.860	
	1:54	0.975	.....	28 30	.....	31 10	.73	85	45	5.731	Clear sky; horizon hazy.
	2:35	1.001	(?) 1	38 45	.....	38 05	.73	86	45	5.908	Rheostat working badly.
	2:53	0.826	.....	43 15	.....	41 20	.72	86	45	5.908	Hazy; some cirrus cloud.
	4:09	0.814	.....	62 15	.....	55 15	.71	86	46	6.030	Hazy near sun; cirrus.
	4:43	0.579	.....	70 45	.....	61 35	.70	85	50	6.368	Heavy haze in west.
15	7:51	0.709	.....	62 15	21 37	55 20	.70	69	90	6.953	Heavy haze in east.
	8:59	0.792	.....	45 15	.....	42 50	.65	76	73	7.049	Heavy haze in east; cirrus.
	10:38	0.828	.....	20 30	.....	26 35	.63	79	69	7.315	Do. Do.
	11:42	0.962	.....	4 30	.....	20 35	.60	79	68	7.199	Haze lighter; readings variable.
28	9:29	0.723	.....	37 45	19 07	39 10	.73	74	88	7.977	Heavy haze.
29	1:16	0.849	.....	19 0	18 53	28 05	.69	81	63	7.104	Cumuli (2) and haze.
31	9:05	1.000	.....	43 45	18 24	43 50	.85	75	55	5.146	Haze; cirrus (1).
	10:07	1.005	.....	28 15	.....	33 35	.85	77	44	4.385	
	11:01	1.070	.....	14 45	.....	26 35	.85	80	45	4.921	No clouds; hazy.
	1:47	0.901	.....	26 45	.....	32 40	.83	81	40	4.510	Hazy.
	2:57	0.802	.....	44 15	.....	44 10	.82	80	46	5.030	Do.
	4:46	0.757	.....	71 30	.....	64 15	.80	78	47	4.829	No clouds; horizon hazy.
August 1	7:16	0.616	.....	71 0	18 09	64 00	.81	68	69	5.161	Cirro-cumuli (5); haze over sun.
	9:15	0.926	.....	41 15	.....	42 15	.81	74	57	5.077	Cirro-cumuli (8); readings variable.
2	9:05	0.709	.....	43 45	17 54	44 10	.75	75	75	7.017	Cumuli (3); light clouds over sun.
9	8:32	1.032	(?) 1	52 0	16 00	51 20	.77	70	67	5.340	Horizon hazy.
13	8:49	1.149	(?) 1	47 45	14 50	49 05	.89	60	56	3.217	Clear.
	9:47	1.242	.....	33 15	.....	39 20	.88	62	49	3.010	Do.
	10:48	1.230	.....	18 0	.....	31 10	.87	63	49	3.111	Do.
	11:54	1.207	.....	1 30	.....	27 00	.85	66	46	3.224	Do.
	12:51	1.207	.....	12 45	.....	29 10	.85	67	44	3.186	Do.
	1:54	1.181	.....	28 30	.....	36 30	.84	69	42	3.244	Do.
	3:16	1.175	(?) 3	49 0	.....	50 00	.82	70	41	3.272	No clouds; haze in west.
14	8:19	1.031	.....	55 15	14 31	54 40	.86	66	58	4.065	Heavy haze; cirrus (3).
	9:17	1.069	.....	40 45	.....	44 30	.86	69	50	3.863	Heavy haze; cirrus.
	10:14	0.719	.....	26 30	.....	35 40	.86	71	48	3.955	Heavy haze over sun; readings variable.
	10:31	1.116	.....	22 15	.....	33 25	.85	72	48	4.084	Heavy haze over sun (7); readings variable.
	12:35	0.824	.....	8 45	.....	28 20	.84	72	46	3.914	Heavy haze; cirrus (7).
15	8:40	0.853	.....	50 0	14 13	51 05	.73	73	67	5.883	Heavy haze; cirrus (4).
	10:13	0.854	.....	26 45	.....	36 00	.72	74	55	4.986	Cumuli (5).
16	12:23	1.176	(?) 2	5 45	13 54	28 25	.62	64	50	3.282	Cumuli (5); sun partly covered.
	2:44	1.156	.....	41 0	.....	45 05	.60	67	46	3.330	Cumuli (3).
18	12:25	1.060	.....	6 15	13 16	29 05	.61	69	62	4.780	Cirro-cumuli (4).

TABLE 3.—*Observations of solar radiation*—Continued.

Date.	T.	Q.	N.	θ.	δ.	Z.	Barometer.	Temperature.	Relative humidity.	Absolute humidity.	Weather.
1902.	h. m.			° ′	(South.) ° ′	° ′	*Inches.*	° *F.*	*Per cent.*	*Grs. cu. ft.*	
August 20	7:44	0.914	.....	64 0	12 37	62 20	.74	65	76	5.154	No clouds; haze.
	8:50	1.102	.....	47 30	.....	50 25	.74	66	63	2.313	Fine sky.
	9:44	1.064	.....	34 0	.....	41 35	.75	68	59	4.414	Fine cirrus over sun.
	10:44	1.093	.....	19 0	.....	33 35	.75	69	55	4.250	Cumuli (3); readings variable.
	11:51	1.076	.....	2 15	.....	29 15	.75	71	50	4.120	Cumuli (6); readings variable.
	1:25	1.040	.....	21 15	.....	34 35	.75	72	47	3.999	Cumuli (4).
25	9:02	1.048	.....	44 30	10 56	49 35	.78	68	67	5.012	Few cumuli.
	10:03	1.109	.....	29 15	.....	40 05	.77	69	61	4.713	Cumuli (5).
	10:56	1.166	.....	16 0	.....	33 55	.75	70	54	4.309	Cumuli (3).
26	7:22	0.840	.....	69 30	10 36	67 45	.71	62	84	5.160	No clouds; some haze.
	8:28	0.915	.....	53 0	.....	55 40	.71	67	72	5.214	Clear.
	9:32	1.083	.....	37 0	.....	45 00	.71	70	64	5.107	Do.
	10:32	1.127	.....	22 0	.....	36 40	.71	73	55	4.830	Do.
	11:37	1.103	.....	5 45	.....	31 40	.70	74	51	4.624	Few cumuli.
	12:27	1.142	.....	6 45	.....	31 45	.69	76	50	4.828	Cumuli (2).
	2:27	1.053	.....	36 45	.....	44 50	.67	78	45	4.625	Do.
	3:31	0.973	.....	52 45	.....	55 30	.66	78	45	4.625	Cumuli (1).
27	6:37	0.352	.....	80 45	10 15	76 20	.73	62	89	5.467	Heavy haze near sun.
	6:55	0.452	.....	76 15	.....	73 00	.74	63	85	5.397	Haze over sun.
	7:21	0.625	.....	69 45	.....	68 10	.74	66	80	5.607	Haze.
31	10:04	0.740	.....	29 0	8 50	41 45	.88	70	69	5.506	Heavy haze.
	11:01	0.813	.....	14 45	.....	35 30	.86	74	64	5.798	Do.
	12:11	0.783	.....	2 45	.....	33 05	.85	78	63	6.473	Heavy haze; readings variable.
	1:38	0.858	.....	24 30	.....	39 25	.83	78	67	6.887	Some cirrus; haze over sun.
	2:44	0.908	.....	41 0	.....	48 50	.80	76	70	6.758	Do.
	3:49	0.519	.....	57 15	.....	59 55	.79	75	75	7.017	Some cirrus; heavy haze.
September 1	7:54	0.548	.....	61 0	8 28	62 55	.77	73	91	7.992	No clouds; haze over sun.
	8:43	0.673	.....	49 15	.....	54 35	.76	77	73	7.272	No clouds; very hazy day.
	10:23	0.815	.....	24 15	.....	39 40	.76	80	63	6.889	Do.
	11:29	0.825	.....	7 45	.....	34 05	.75	83	56	6.715	Do.
	12:42	0.799	.....	4 30	.....	33 35	.73	83	46	5.516	Do.
	2:22	0.794	.....	35 30	.....	45 45	.70	84	47	5.807	No clouds; haze.
3	8:00	0.970	(?) 3	60 0	7 44	62 40	.85	65	67	4.543	No clouds; haze over sun.
	8:56	1.039	.....	46 0	.....	52 55	.86	70	55	4.389	No clouds.
	10:01	1.069	.....	29 45	.....	43 05	.87	72	51	4.339	Do.
	11:05	1.139	.....	13 45	.....	36 10	.86	73	49	4.303	No clouds; wind.
	11:51	1.168	.....	2 15	.....	34 10	.85	73	46	4.040	No clouds; gusty wind.
	1:32	1.150	.....	23 0	.....	39 40	.84	74	44	3.988	No clouds; readings variable.
5*	8:40	1.130	.....	50 0	7 00	56 10	.80	60	63	3.620	Fine sky.
16	1:35	0.786	.....	28 45	2 50	46 45	30.04	67	40	2.896	Blue sky; light streaky haze.
	2:48	0.775	8	42 0	.....	54 10	.03	66	41	2.874	Do.
	4:23	0.372	.....	65 45	.....	70 10	.03	65	42	2.849	Do.
	5:04	0.298	.....	76 0	.....	77 40	.03	64	45	2.954	Do.
17	8:31	0.348	.....	52 15	2 27	61 00	.12	55	91	4.413	Bluish sky; haze.
	11:04	0.698	.....	14 0	.....	41 20	.12	65	63	4.272	Do.
	12:43	0.801	.....	10 45	.....	40 35	.10	67	45	3.258	Bluish sky; haze heavier.
	1:40	0.737	.....	25 0	.....	45 20	.10	67	44	3.184	Do.
	2:35	0.603	.....	38 45	.....	52 30	.09	66	45	3.206	Do.
	3:01	0.548	.....	45 15	.....	56 25	.09	66	46	3.224	Do.
	4:49	0.250	.....	72 15	.....	75 10	.09	64	57	3.742	Bluish sky; haze streaky.
	5:04	0.175	.....	76 0	.....	78 00	.09	63	59	3.745	Bluish sky; haze quite heavy.
23	9:45	0.852	.....	33 45	0 07	51 35	29.76	63	84	5.333	Bluish sky; some haze.
	12:27	0.961	.....	6 45	.....	42 10	.72	72	51	4.479	Bluish sky (oppressively hot).
	2:55	0.858	.....	43 45	.....	57 20	.69	73	52	4.567	Bluish sky; few cumuli.
					(South).						
24	7:39	0.510	.....	65 15	0 16	72 00	.72	65	90	6.104	Bluish sky; clouds near horizon.
	8:32	0.670	.....	52 0	.....	62 55	.72	68	85	6.358	Do.
28	10:44	0.852	.....	19 0	1 50	46 55	.59	71	73	6.015	Do.
	12:42	0.970	(?) 2	10 30	.....	44 40	.57	71	74	6.098	Scattered clouds; readings variable.
	12:53	0.243	(?) 2	13 15	.....	45 15	.56	71	74	6.098	Through a cloud.

* The observations of July 4 to September 5, inclusive, were made by Mr. Robinson Pierce, jr.; all others by Mr. H. N. Davis.

sor Upton, and those taken at the Hope Reservoir for the city engineer. These stations are quite close to each other and to both places at which observations were made; and since the continuous record sheets were more accessible at the former place, and were found upon comparison to agree reasonably with the tabular synopsis published by the city engineer they have been used.

The barometer readings are in inches and are not reduced to sea level. The instrument is 214 feet above sea level. The relative humidity and temperature (t) are also taken from the continuous records, and these as well as the barometer readings are compared once a day with standard instruments. The absolute humidity is given in grains per cubic foot, and is calculated from relative humidity and temperature by means of the tables[5] supplied by the Weather Bureau. In the last column are given such cloud notes as were made at the time of each observation. In general the term cumulus was accurately used, while cirrus and stratus were applied more loosely, the first to wispy, the second to sheet forms, and should not be relied upon too literally. Where figures are given they indicate the amount of sky covered, in tenths.

It seems hardly worth while to attempt a direct determination of the solar constant itself by the usual methods from these data, for morning observations in Providence are almost always influenced by a heavy haze on the horizon, and very rarely are conditions even approximately uniform throughout any considerable portion of a day. Their chief value would appear to be more strictly meteorological, and it is hoped that they and such others of the same kind as may have been collected by the Bureau may be discussed from this point of view.

[5] "Psychrometric Tables, etc.," prepared by Prof. C. F. Marvin. Washington, 1900. Table XII, pp. 83–84.

RECENT PAPERS BEARING ON METEOROLOGY.

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Science. New York. N. S. Vol. 17.

Clayton, H. H. [Review of] Handbook of Climatology. Part 1. General Climatology. By Dr. Julius Hann. Translated by Robert DeCourcy Ward. Pp. 819–820.

Scientific American. New York. Vol. 88.
—— Death of Mr. Follett Osler, inventor of the anemometer. Pp. 409–410.
—— A man who was struck by lightning and lives. P. 416.
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NOTES AND EXTRACTS.

AN INCIPIENT TORNADO IN IOWA.

Mr. Charles A. Robertson, of Onawa, Monona County, Iowa, staff correspondent of the Sioux City Tribune, furnishes an account of a whirlwind in the eastern part of Monona County, between 5:15 and 5:30 p. m. Friday, June 26, 1903. He says:

A great mass of black clouds was gathering, and on the western edge of a rift in the clouds were plainly to be seen two strange objects. In the north and west the sky was clear and the sun shining, while in the southeast, for fully half an hour, the queer long-tailed specters wavered in the air, moving in a general way southerly. Suddenly, the long tail of the larger whirl seemed to part from the upper funnel-shaped mass and descend to the ground like a long tin waterspout, while a faint light ap-

peared between the upper and lower portions. Telephone messages afterwards received from points to the southeast, such as Moorhead, distant 15 miles, and from Ute, which is 20 miles east of Onowa, and from Blencoe, 8 miles south, state that the waterspouts, whirlwinds, or tornadoes were seen by all, causing much uneasiness, but no damage was experienced, and also that for a long time, one of the two threatening clouds remained stationary over a lake about 3 miles southeast of Turin, which is itself 7 miles east of Onawa, and that it drew a supply of water up from the lake, sucking up also, fish, frogs, worms, and vegetable matter, all of which were afterwards dropped back in that locality.

WEATHER BUREAU MEN AS INSTRUCTORS.

Among the replies to circular letter of March 4 are the following: Mr. R. G. Allen, Section Director, Ithaca, N. Y., says:

Prof. R. S. Tarr, of Cornell University, has for several years given a course in elementary meteorology, covering the first half of each collegiate year. For the last three years I have assisted in this course, giving instruction in what is termed the "laboratory work," which consists of practise work in making weather maps and forecasts, climatic charts, and observations of instruments and record sheets. Professor Tarr's work consisted of lectures and recitations.

During the first year of this work I had no official connection with Cornell University, but during the two last years I have been officially appointed as "assistant in meteorology," at a salary of $200 for the half term of four months, or about $50 per month. It was understood that I was to give two and one-half hours a week, which was all that was necessary the first year with a class of 27 students, but with a class of about forty-eight students last year, divided into five sections, in addition to a few stragglers and football men, who were continually coming in to make up back work, it required about ten hours a week, which I can not spare and properly perform my Weather Bureau work. Accordingly I have informed Professor Tarr that it will be impracticable for me to assist him next year. He has decided that he can not continue the work, on account of the increasing size of the class, and it will be dropped next year, unless the University, provides for a regular course in this subject.

Referring to a previous report by Mr. R. G. Allen, Section Director, we note that he assisted Professor Tarr in his class in elementary meteorology about ten hours each week during the first half of the collegiate year 1902–3. There were about forty or fifty pupils, including the freshmen of the college of forestry, and also a few elective students. This work was very agreeable and appropriate, but was difficult to handle in addition to the numerous and exacting duties necessary to administer the large Climate and Crop section center. Two of the class of 1901–2 took additional work leading up to work in the Weather Bureau, during the year 1902–3, one of whom secured an appointment in the Bureau in less than ten days after graduation, and the other is on the eligible list, with a rating above 80. The appointee referred to was able to take up station work immediately on arriving at his first station, and the other, in case of appointment, will be able to do the same.

In connection with the relinquishment of meteorology as a part of the course in geology, Mr. R. G. Allen reports under date of July 18 that he has consulted with Professor Bailey, Dean of the College of Agriculture, relative to a proposed course of instruction in that college, and the following item has been added to the agricultural course conformably with the desire of the Chief of Bureau:

Course No. 72.—Agricultural meteorology and climatology, second half-year, three hours a week, lecture and laboratory, Mr. Allen.

Mr. Allen adds:

I will undertake during the next five or six months to prepare for this extra work and any suggestions or information that can be used in outlining the course and work will be duly appreciated. There is to be no remuneration for this work, and my time is already well taken up, but I shall endeavor to carry out the wishes of the Central Office.

Mr. G. A. Loveland, Section Director, Lincoln, Nebr., writes as follows:

I am at the present time, and have for the past three years, been teaching meteorology in the University of Nebraska. I have been elected by the regents of the University a member of the faculty, with the title of instructor of meteorology, for each of the past three years, and suppose that I am to be considered as a permanent member of the faculty within the meaning of the circular. No salary is paid me, but an allowance of $60 per year is made for equipment and student aid in experiments and correcting exercises.

The number of students during the past three years has increased from 5 at the beginning to 29 at the present time. Two courses are given; one where the class meets 17 times and one where the class meets 51 times. The shorter course is necessarily a very brief survey of the subject, given principally in lectures with Waldo's Meteorology as a consulting text-book. The longer course is given in the spring semester and treats the subject much more completely, and especially that phase which is useful to agricultural students.

At one period during the year a brief lecture of about twenty minutes on the subject of meteorology was given at the convocation hour in the University chapel, a general meeting place of the students.

In this connection it may be proper to state that it is expected that a new building, to be devoted to physics, will be built on the campus during the coming year and it is the present plan to include adequate accommodations for the Weather Bureau office, also laboratory and recitation rooms for instruction in meteorology.

Mr. J. R. Weeks, Observer, Weather Bureau, Macon, Ga., reports a lecture on the weather to pupils of the Winship School, June 19, 1903.

Many persons are watching with interest the efforts made by the officials of the Weather Bureau to respond as far as practicable to the great demand that is being made for instruction and lectures in meteorology. It is undoubtedly the policy of the Bureau to contribute as much as possible to an enlightened appreciation of the difficulties experienced by the meteorologist and to educate the community in the fundamental principles of the science that is so frequently misunderstood. The notes that we have recently published showing the activity of the Weather Bureau men as instructors and especially the reports from the men engaged in our larger colleges, show that an immense amount of work is being done willingly and faithfully, but also gratuitously, so far as the colleges and universities are concerned. There seems to be everywhere a recognition of the need for instruction and of the demand for education, but no recognition of the fact that the instructor should be properly paid for his work. Congress has not made it a specific duty of Weather Bureau officials to to give instruction in colleges, as it has done in the case of army officers, who are assigned by the President for a term of years as instructors in military affairs, and are for the time being relieved from all other duty. The instruction given by the Weather Bureau officials is additional to their eight hours per day of Government work and it is very surprising that they should be able to do all this extra work with satisfaction to the colleges, in view of the high demands made by modern educators. We suppose that as long as the colleges and their students can get such satisfactory work at little or no expense, they will continue to do so; but we must submit to the friends of education that professorships of meteorology should be endowed and Weather Bureau men be given an opportunity of resigning from their present duties and devoting themselves wholly to instruction and the building up of schools of meteorology.—*C. A.*

LUNAR RAINBOW.

Mr. T. S. Outram, Section Director, of Minneapolis, Minn., forwards an account by Mrs. Peoples, of Detroit City, Minn., describing a lunar rainbow seen on the face of the cloud, following a shower, during the evening of July 9, 1903. The moon was nearly full and near the zenith at 9:55 p. m. The rainbow was formed among the raindrops of a shower bearing northwest from the station.

THE CLIMATE AND THE SUGAR BEET.

Dr. H. W. Wiley, Chief of the Bureau of Chemistry, U. S. Department of Agriculture, has recently published a new con-

tribution to the study of the influence of soil and climate on the composition of the sugar beet (Bulletin No. 74 of the Bureau of Chemistry), from which we abstract the following items. This study refers to the weather of the growing season of 1901. The experiments were made at Washington, D. C.; Lafayette, Ind.; Ames, Iowa; Lexington, Ky.; Lansing, Mich.; Geneva and Ithaca, N. Y.; Logan, Utah, Blacksburg, Va., and Madison, Wis. The soils at these stations were examined as to their physical and other characteristics, and with respect to these Dr. Wiley says:

> While it is doubtless true that the character of the soil influences to a greater or less degree the quality of some crops, yet it is certain that in the case of the sugar beet its principal influence is exerted almost exclusively upon the magnitude of the crop.

And again:

> It is evident that while the texture of the soil, as shown by the mechanical analysis, undoubtedly has a direct bearing on the yield per acre, it has practically no effect on the content of sugar in the beet. This is also true of the chemical properties of the soil.

As regards latitude and sunshine it may be said that with one exception, viz, Blacksburg, Va., at an altitude 2100 feet, the sugar content and the latitude seem to increase and decrease together. With regard to sunshine, the percentage of possible sunshine seems to have but little effect upon the sugar content, and it appears to be well established that the chemical activities of the sun's light in promoting the condensation of carbo-hydrate molecules in the chlorophyll cells are not notably diminished by filtration through aqueous vapor. As regards the distribution of sunshine, it must be said that the actual predominance of clear days is not to be reckoned as an important factor, except in so far as it may indicate drought, and thus interfere with the magnitude of the crop; thus the large number of clear days at Ames was accompanied by excessively dry weather. The relation between the average length of the day and the sugar in the beet is most interesting; in general the percentage of sugar increases with the length of the day. This is in harmony with the commonly accepted theory of the correlation of the functional activity of the chlorophyll cells and the light of the sun. Under the same general conditions, it is evident that the longer the hours of activity, the greater the amount of work accomplished; hence, with longer hours of daylight, the greater the quantity of carbo-hydrates that is formed.

As regards temperature, it is evident that the tendency of the sugar is to diminish as the temperature increases, but in general, the percentage of sugar in the beet increases with the coefficient of purity of the juice.

The chart showing the percentage of sugar in the beet, the altitude of the station, and the rainfall shows the remarkable effect of the altitude of the Blacksburg station. It is the altitude that has secured for this station the highest content of sugar in the beet. At the Washington station the lowest altitude coincides with the lowest percentage of sugar.

The absolute amount of rainfall does not have so great an influence on the composition of the beet as does its distribution. Give a sufficient quantity of water to secure normal growth, the beet is not very sensitive to a slight diminution or increase, but it is important that the rainfall be not too great in September, which is a period of ripening, nor in October, which is the season of harvesting.

IS THE MOON'S INFLUENCE ON THE WEATHER WORTH ANY FURTHER INVESTIGATION.

Rev. F. L. Odenbach, Director of the Meteorological Observatory, St. Ignatius College, Cleveland, Ohio, writes as follows:

> With reference to the rain theory of Mr. H. C. Russell, of Sydney, N. S. W., I have looked up the extensive literature on the subject extending through the two last centuries up to date. An immense amount has been written on the subject.
>
> The sum and substance of all the work done along this line has failed to bring out anything that might be considered a law or be used as a safe rule in questions of climatology or weather forecasting.
>
> I, myself, think that the moon (and why not the sun and the planets?) must have *some* influence on our weather. Yet this influence must be so slight, or so concealed, that all these years of observation and hard work have not resulted in anything worth considering.
>
> The great objection I have to this new exposition of Mr. Russell is that from the start he distinguishes between the rainfall on the coast and that of the interior. Why? In this point Mr. Russell follows all of his predecessors. The rule is bolstered up with exceptions and conditions, subconditions, and special combinations until the application becomes a mere guesswork. My general impression on the subject is that about as much time has been wasted on this matter as on the "Perpetuum mobile," and with about the same success. Being in this mood I think it best not to write anything for the REVIEW, for fear lest some might take up the matter and neglect other lines of much more importance and far greater utility. Had clouds received half the attention allotted to the moon I am certain we would have derived immense benefit from that study.
>
> I am at present spending all my spare time on this latter subject and hope that in the near future I will be able to send something for the REVIEW.

THE WEATHER OF THE MONTH.

By Mr. W. B. STOCKMAN, Forecast Official, in charge of Division of Meteorological Records.

PRESSURE.

The distribution of mean atmospheric pressure is graphically shown on Chart IV and the average values and departures from normal are shown in Tables I and VI.

The mean barometer was highest over the region from Kansas northeastward over central and western Lake Superior and northward over eastern North Dakota, with readings of 30.00 inches or slightly higher. It was lowest over the middle and southern Plateau regions, within which the lowest was 29.72 inches at Yuma.

The pressure was below the normal in southwestern New England, the Middle and South Atlantic and east Gulf States, eastern part of the west Gulf States, the Ohio Valley and Tennessee, eastern upper Lake region, lower Lake region, and the interior of the Pacific States; elsewhere it was above the normal. The greatest minus departures occurred over portions of North Carolina, and amounted to —.10 inch. The maximum plus departures occurred over the slope regions, Missouri Valley, northern portion of the Mississippi Valley, and North Dakota, and ranged generally from + .10 inch to + .15 inch.

Over the region from the Mississippi River westward to the one hundred and fifteenth meridian, except in Louisiana, on the Texas coast, and in southwestern Arizona, the pressure increased over that of May, 1903, with maximum departures amounting to +.10 inch to +.14 inch, in the slope regions and North Dakota. Over the remainder of the country the pressure diminished from that of May, 1903, and as a rule the departures were more marked, in the Atlantic States north of Florida, the eastern parts of the Ohio Valley and Tennessee, eastern upper Lake region, and lower Lake region, ranging from —.10 inch to —.22 inch.

TEMPERATURE OF THE AIR.

The distribution of maximum, minimum, and average surface temperatures is graphically shown by the lines on Chart VI.

In the Pacific States except southwestern California, Nevada, Idaho, Montana, western Wyoming, Arizona, and northeastern Minnesota the temperature was above the normal, but the departures were not very marked except in western Montana, Idaho, northern Nevada, and the eastern parts of Washington and Oregon, where they ranged from + 3.0° to + 7.3°; elsewhere the temperature was below the normal and as a rule

the departures were very marked, causing the month to be an unusually cool one over the States from the central parts of New Mexico, Colorado, southern Nebraska, southeastern South Dakota, and Wisconsin eastward to the Atlantic Ocean, a number of stations showing the lowest mean monthly temperature for June on record.

The isotherm of 70° mean temperature trends westward about latitude 35° from the Atlantic Ocean to the hundredth meridian and is but about one hundred miles north of the position occupied by the isotherm of 80° mean temperature for June, 1902. In June, 1903, the isotherm of 80° mean temperature only appears over southern Florida, the lower Rio Grande Valley, and the southern and western parts of the southern Plateau region. The difference in the location of the isotherm of 60° mean temperature, between June, 1902, and June, 1903, is not very marked.

Maximum temperatures of 100° or higher were reported only from portions of the southern and middle slope and southern Plateau regions and the valleys of California, whereas in June, 1902, they occurred over the greater portion of the Gulf and South Atlantic States and the slope and Plateau regions.

Maximum temperatures of from 110° to 117° occurred in a small portion of the southern Plateau region, the isotherm of 110° occupying practically the same position as that of 120° in June, 1902. No maximum temperatures of 120° or higher were reported during June, 1903.

Freezing temperatures were reported from portions of eastern Tennessee, Michigan, Minnesota, Wisconsin, Nevada, Washington, and Oregon.

By geographic districts the temperature was in excess in the Pacific and middle and northern Plateau regions, the greatest departure reported being + 5.0° per day in the northern Plateau region. In the Atlantic and Gulf States, Ohio Valley and Tennessee, Lake region, upper Mississippi and Missouri valleys, and middle and southern slope regions the deficiencies ranged from 3.0° to 6.3° per day, the greatest departure occurring in the southern slope region.

The average temperatures for the several geographic districts and the departures from the normal values are shown in the following table:

Average temperatures and departures from normal.

Districts.	Number of stations.	Average temperatures for the current month.	Departures for the current month.	Accumulated departures since January 1.	Average departures since January 1.
		°	°	°	°
New England	8	57.8	— 5.4	+ 9.5	+ 1.6
Middle Atlantic	12	65.7	— 5.2	+10.0	+ 1.7
South Atlantic	10	73.4	— 3.2	+ 2.5	+ 0.4
Florida Peninsula*	8	79.2	— 0.4	+ 4.4	+ 0.7
East Gulf	9	74.7	— 4.1	— 7.8	— 1.3
West Gulf	7	74.2	— 4.8	— 9.1	— 1.5
Ohio Valley and Tennessee	11	68.4	— 5.6	+ 2.4	+ 0.4
Lower Lake	8	62.4	— 4.7	+10.8	+ 1.8
Upper Lake	10	59.3	— 3.0	+14.1	+ 2.4
North Dakota*	8	62.7	— 1.7	+ 6.4	+ 1.1
Upper Mississippi Valley	11	66.7	— 4.5	+ 7.1	+ 1.2
Missouri Valley	11	66.7	— 4.0	+ 3.5	+ 0.6
Northern Slope	7	62.8	— 0.2	+ 0.8	+ 0.1
Middle Slope	6	66.5	— 5.0	— 7.0	— 1.2
Southern Slope*	6	70.2	— 6.3	—12.5	— 2.1
Southern Plateau*	13	71.6	— 2.4	—10.1	— 1.7
Middle Plateau*	8	65.2	+ 0.3	—17.2	— 2.9
Northern Plateau*	12	65.5	+ 5.0	+ 4.7	+ 0.8
North Pacific	7	59.2	+ 1.6	— 0.9	— 0.2
Middle Pacific	5	63.3	+ 1.4	— 4.8	— 0.8
South Pacific	4	67.5	+ 1.0	— 2.5	— 0.4

*Regular Weather Bureau and selected voluntary stations.

In Canada.—Prof. R. F. Stupart says:

The mean temperature of June was higher than the average in British Columbia, the Northwest Territories, and Manitoba, and below average from the Great Lakes to the Maritime Provinces. The largest positive departure from average amounted to about 3° near the Pacific coast and in northern Alberta and Saskatchewan, and the largest negative departure to 6° in Cape Breton. The temperature was from 1° to 4° below average over the larger portions of Ontario, Quebec, and the Maritime Provinces.

PRECIPITATION.

The distribution of total monthly precipitation is shown on Chart III.

The precipitation was in excess of the normal 2.0 to 5.8 inches in northern Georgia, northern and central South Carolina, southeastern North Carolina, eastern Pennsylvania, eastern and central New York, New England generally, and southeastern Michigan.

It was deficient 2.0 to 4.4 inches in the greater portion of the Mississippi Valley, lower Missouri Valley, North Dakota generally, southeastern Montana, and southeastern Kansas.

The greatest monthly amounts of precipitation were reported from portions of southern Florida, northeastern Georgia, South Carolina, southwestern North Carolina, eastern Tennessee, and south-central Virginia.

By geographic districts the precipitation was in excess in New England, the Atlantic States, lower Lake region, southern Plateau, and North Pacific districts; elsewhere it was deficient, except in the middle Plateau region where it was normal.

Average precipitation and departure from the normal.

Districts.	Number of stations.	Average.		Departure.	
		Current month.	Percentage of normal.	Current month.	Accumulated since Jan. 1.
		Inches.		*Inches.*	*Inches.*
New England	8	5.16	174	+2.2	+1.6
Middle Atlantic	12	5.01	139	+1.4	0.0
South Atlantic	10	5.71	116	+0.8	+2.1
Florida Peninsula*	8	5.76	83	—1.2	+6.2
East Gulf	9	3.84	73	—1.4	+1.1
West Gulf	7	3.18	82	—0.7	—1.0
Ohio Valley and Tennessee	11	3.81	88	—0.5	—0.8
Lower Lake	8	4.35	119	+0.7	+0.7
Upper Lake	10	1.72	46	—2.0	—2.4
North Dakota*	8	1.44	40	—2.2	—3.0
Upper Mississippi Valley	11	2.34	52	—2.2	—1.9
Missouri Valley	11	2.95	68	—1.4	+0.4
Northern Slope	7	2.10	81	—0.5	—0.8
Middle Slope	6	2.12	73	—0.8	+1.4
Southern Slope*	6	2.67	77	—0.8	—0.5
Southern Plateau*	13	1.36	296	+0.9	+0.7
Middle Plateau*	8	0.54	100	0.0	+0.1
Northern Plateau*	12	1.27	86	—0.2	—3.3
North Pacific	7	2.37	109	+0.2	—6.6
Middle Pacific	5	0.12	23	—0.4	—3.7
South Pacific	4	T.	0	—0.1	+0.4

*Regular Weather Bureau and selected voluntary stations.

In Canada.—Professor Stupart says:

The most marked feature of the June rainfall was the excessive quantity in eastern Ontario and western Quebec, where from 5 to 7 inches fell. The extreme southwestern districts of Nova Scotia and New Brunswick also showed an excess, but in all other portions of the Dominion there was a deficiency, and in Manitoba and the more southern portions of the Territories the rainfall was decidedly scant; stations in southern and eastern Manitoba, in but few instances, report more than an inch, and at Medicine Hat, in western Assiniboia, there were but a few light sprinkles.

HAIL.

The following are the dates on which hail fell in the respective States:

Alabama, 20, 22, 26. Arizona, 10, 11, 13. Arkansas, 8, 21, 22, 25, 26. California, 9, 16. Colorado, 2, 3, 4, 5, 6, 7, 8, 10, 13, 14, 15, 16, 17, 18, 19, 20, 21, 23, 24, 25, 28. Connecticut, 14. Florida, 6, 8, 29. Georgia, 1, 8, 11, 17, 18, 19, 20, 24, 26. Idaho, 1, 13, 15, 17. Illinois, 2, 5, 8, 11, 16, 17, 19. Indiana, 1, 5, 6, 7, 9, 13, 16, 22. Indian Territory, 20. Iowa, 6, 7, 8, 10, 18, 29, 30. Kansas, 19, 21, 24, 30. Kentucky, 1, 6, 8, 17, 28. Louisiana, 24. Maryland, 8, 10, 16, 17, 20. Michigan, 6, 7, 18. Minnesota, 7, 8, 29, 30. Mississippi, 5, 24, 26. Missouri, 5, 7, 8, 9, 20, 21. Montana, 3, 19, 23, 27, 30. Nebraska, 7, 8, 17, 18, 19, 20, 21, 22, 23, 24, 29, 30. Nevada, 2, 8. New Jersey, 10, 13, 14, 20. New Mexico, 2, 3, 8, 9, 14, 15, 17, 19,

25. New York, 8, 9, 10, 12, 13, 18, 19, 20. North Carolina, 6, 7, 8, 17, 18, 19, 20. Ohio, 5, 6, 8, 9, 22, 23. Oklahoma, 20, 21, 23, 24. Oregon, 1, 11, 12, 14, 15. Pennsylvania, 7, 9, 10, 13, 16, 25. South Carolina, 1, 2, 6, 9, 17, 18, 19, 20, 22, 24, 25. South Dakota, 6, 8, 10, 17, 18, 19, 20, 23, 28, 29, 30. Tennessee, 1, 9, 11, 17, 20, 22. Texas, 6, 7, 19, 23, 24, 25. Utah, 9, 15. Vermont, 19. Virginia, 7, 12, 17, 20. Washington, 15, 16. West Virginia, 9, 11, 13, 20. Wisconsin, 18, 22. Wyoming, 3, 5, 13, 14, 15, 16, 18, 19, 20, 23, 28, 29.

SLEET.

The following are the dates on which sleet fell in the respective States:

Colorado, 5, 10, 20.

HUMIDITY.

The relative humidity was normal in the South Atlantic and east Gulf States, and the upper Mississippi Valley; slightly below normal in the Florida Peninsula, west Gulf States, upper Lake region, North Dakota, and the middle Pacific district; elsewhere it was above normal, with marked departures in the middle and southern slope, southern Plateau and north Pacific regions.

The averages by districts appear in the subjoined table:

Average relative humidity and departures from the normal.

Districts.	Average.	Departure from the normal.	Districts.	Average.	Departure from the normal.
	%			%	
New England	83	+ 4	Missouri Valley	69	+ 2
Middle Atlantic	79	+ 6	Northern Slope	64	+ 6
South Atlantic	78	0	Middle Slope	69	+ 9
Florida Peninsula	78	— 2	Southern Slope	73	+13
East Gulf	75	0	Southern Plateau	37	+10
West Gulf	74	— 2	Middle Plateau	41	+ 3
Ohio Valley and Tennessee	74	+ 4	Northern Plateau	53	+ 1
Lower Lake	77	+ 6	North Pacific	77	+ 8
Upper Lake	71	— 2	Middle Pacific	62	— 1
North Dakota	64	— 4	South Pacific	68	+ 2
Upper Mississippi Valley	70	0			

ATMOSPHERIC ELECTRICITY.

Numerical statistics relative to auroras and thunderstorms are given in Table IV, which shows the number of stations from which meteorological reports were received, and the number of such stations reporting thunderstorms (T) and auroras (A) in each State and on each day of the month, respectively.

Thunderstorms.—Reports of 6045 thunderstorms were received during the current month as against 6406 in 1902 and 5690 during the preceding month.

The dates on which the number of reports of thunderstorms for the whole country was most numerous were: 8th, 359; 9th, 316; 19th, 295; 20th, 307.

Reports were most numerous from: Missouri, 329; Ohio, 283; North Carolina, 254; Florida, 250.

Auroras.—The evenings on which bright moonlight must have interfered with observations of faint auroras are assumed to be the four preceding and following the date of full moon, viz: 5th to 13th.

In Canada: Thunderstorms were reported at St. John, N. B., 8, 12; St. Johns, N. F., 28; Halifax, 25; Grand Manan, 12, 25, 26; Yarmouth, 10, 25; Charlottetown, 27; Father Point, 10; Quebec, 10, 11, 20; Montreal, 18, 25, 26; Kingston, 13, 24; Toronto, 9, 24; White River, 9; Port Stanley, 7, 17, 19; Parry Sound, 21; Port Arthur, 21; Winnipeg, 8, 29; Qu'Appelle, 3, 4, 18, 23; Medicine Hat, 18; Swift Current, 3, 14, 18, 30; Banff, 13, 17, 29; Battleford, 30; Barkerville, 10, 12, 25; New Westminster, 17, 20; Hamilton, Bermuda, 23.

An aurora was reported from White River on the 17th.

SUNSHINE AND CLOUDINESS.

The cloudiness was above the average, except in the upper Lake region and northern slope, where it was normal, and in the Florida Peninsula, North Dakota, upper Mississippi Valley, and the northern Plateau region, where it was slightly below the normal.

The distribution of sunshine is graphically shown on Chart VII, and the numerical values of average daylight cloudiness, both for individual stations and by geographical districts, appear in Table I.

The averages for the various districts, with departures from the normal, are shown in the following table:

Average cloudiness and departures from the normal.

Districts.	Average.	Departure from the normal.	Districts.	Average.	Departure from the normal.
New England	7.0	+ 1.9	Missouri Valley	4.9	+ 0.1
Middle Atlantic	6.6	+ 1.6	Northern Slope	4.8	0.0
South Atlantic	5.4	+ 0.5	Middle Slope	5.7	+ 2.0
Florida Peninsula	5.4	— 0.1	Southern Slope	6.2	+ 1.8
East Gulf	5.4	+ 0.6	Southern Plateau	3.0	+ 1.1
West Gulf	4.7	+ 0.1	Middle Plateau	3.5	+ 0.5
Ohio Valley and Tennessee	5.6	+ 0.6	Northern Plateau	4.7	— 0.4
Lower Lake	5.8	+ 0.9	North Pacific	6.9	+ 0.8
Upper Lake	5.2	0.0	Middle Pacific	3.3	+ 0.1
North Dakota	4.2	— 1.0	South Pacific	3.8	+ 0.5
Upper Mississippi Valley	4.8	— 0.2			

WIND.

The maximum wind velocity at each Weather Bureau station for a period of five minutes is given in Table I, which also gives the altitude of Weather Bureau anemometers above ground.

Following are the velocities of 50 miles and over per hour registered during the month:

Maximum wind velocities.

Stations.	Date.	Velocity.	Direction.	Stations.	Date.	Velocity.	Direction.
Amarillo, Tex	19	50	nw.	Mount Tamalpais, Cal.	29	50	nw.
Atlanta, Ga	20	56	n.	North Head, Wash	26	54	se.
Block Island, R. I.	12	72	e.	Do	27	52	s.
El Paso, Tex	1	59	ne.	Point Reyes Light, Cal.	1	60	nw.
Fort Worth, Tex	24	56	nw.	Do	3	53	nw.
Mount Tamalpais, Cal	1	59	nw.	Do	4	50	nw.
Do	2	59	nw.	Do	13	61	nw.
Do	3	59	nw.	Do	14	50	nw.
Do	4	55	nw.	Do	22	57	nw.
Do	7	52	nw.	Do	23	56	nw.
Do	8	56	nw.	Do	24	70	nw.
Do	9	55	nw.	Do	25	66	nw.
Do	18	50	nw.	Do	26	55	nw.
Do	19	60	nw.	Do	28	51	nw.
Do	20	68	nw.	Do	29	65	nw.
Do	22	56	nw.	Do	30	75	nw.
Do	24	54	nw.	Sioux City, Iowa	8	66	nw.
Do	25	62	nw.	Tatoosh Island, Wash	7	56	e.
Do	26	58	nw.	Taylor, Tex	22	50	nw.
Do	27	51	nw.	Valentine, Nebr	23	50	nw.
Do	28	50	nw.				

DESCRIPTION OF TABLES AND CHARTS.

By Mr. W. B. STOCKMAN, Forecast Official, in charge of Division of Meteorological Records.

Table I gives, for about 137 Weather Bureau stations making two observations daily and for about 31 others making only one observation, the data ordinarily needed for climatological studies, viz, the monthly mean pressure, the monthly means and extremes of temperature, the average conditions as to moisture, cloudiness, movement of the wind, and the depar-

tures from normals in the case of pressure, temperature, and precipitation, the total depth of snowfall, and the mean wet-bulb temperatures. The altitudes of the instruments above ground are also given.

Table II gives, for about 2,800 stations occupied by voluntary and other cooperating observers, the highest maximum and the lowest minimum temperatures, the mean temperature deduced from the average of all the daily maxima and minima, or other readings, as indicated by the numeral following the name of the station, the total monthly precipitation, and the total depth in inches of any snow that may have fallen. When the spaces in the snow column are left blank it indicates that no snow has fallen, but when it is possible that there may have been snow of which no record has been made, that fact is indicated by leaders, thus (. . . .).

Table III gives, for all stations that make observations at 8 a. m. and 8 p. m., the four component directions and the resultant directions based on these two observations only and without considering the velocity of the wind. The total movement for the whole month, as read from the dial of the Robinson anemometer, is given for each station in Table I. By adding the four components for the stations comprised in any geographical division the average resultant direction for that division can be obtained.

Table IV gives the total number of stations in each State from which meteorological reports of any kind have been received, and the number of such stations reporting thunderstorms (T) and auroras (A) on each day of the current month.

Table V gives a record of rains whose intensity at some period of the storm's continuance equaled or exceeded the following rates:

Duration, minutes	5	10	15	20	25	30	35	40	45	50	60	80	100	120
Rates per hour (ins.)	3.00	1.80	1.40	1.20	1.08	1.00	0.94	0.90	0.86	0.84	0.75	0.60	0.54	0.50

In the northern part of the United States, especially in the colder months of the year, rains of the intensities shown in the above table seldom occur. In all cases where no storm of sufficient intensity to entitle it to a place in the full table has occurred, the greatest rainfall of any single storm has been given, also the greatest hourly fall during that storm.

Table VI gives, for about 30 stations furnished by the Canadian Meteorological Service, Prof. R. F. Stupart, director, the means of pressure and temperature, total precipitation and depth of snowfall, and the respective departures from normal values, except in the case of snowfall.

Table VII gives the heights of rivers referred to zeros of gages; it is prepared by the Forecast Division.

NOTES EXPLANATORY OF THE CHARTS.

Chart I, tracks of centers of high areas, and Chart II, tracks of centers of low areas, are prepared by the Forecast Division. The roman numerals show number and chronological order of highs (Chart I) and lows (Chart II). The figures within the circles show the days of the month; the letters *a* and *p* indicate, respectively, the observations at 8 a. m. and 8 p. m., seventy-fifth meridian time. Within each circle is also given (Chart I) the highest barometric reading and (Chart II) the lowest barometric reading at or near the center at that time, and in both cases as reduced to sea level and standard gravity.

Chart III.—Total precipitation. The scale of shades showing the depth of rainfall is given on the chart itself. For isolated stations the rainfall is given in inches and tenths, when appreciable; otherwise, a "trace" is indicated by a capital T, and no rain at all by 0.0.

Chart IV.—Sea-level pressure and resultant surface winds. The pressures have been reduced to sea level and standard gravity by the method fully described by Prof. Frank H. Bigelow on pages 13–16 of the REVIEW for January, 1902. The pressures have also been further reduced to the mean of the twenty-four hours by the application of a suitable correction, to the mean of the 8 a. m. and 8 p. m. readings, at stations taking two observations daily, and to the 8 a. m. or 8 p. m. observation, respectively, at stations taking but a single observation. The diurnal corrections so applied will be found in Table 27, Volume II, Annual Report of the Chief of Weather Bureau, 1900–1901, pp. 140–164.

The isotherms on the sea-level plane have been constructed by means of the data summarized in chapter 8 of Professor Bigelow's Report on the Barometry of the United States and Canada, which can be found in the Annual Report of the Chief of the Weather Bureau for 1900–1901, Volume II. The correction $t_0 - t$, or temperature on the sea-level plane minus the station temperature, by Table 48 of the Barometry Report, is added to the observed surface temperature to obtain the adopted sea-level temperature.

The wind directions are the computed resultants of observations at 8 a. m. and 8 p. m. daily. The resultant duration is shown by figures attached to each arrow.

Chart V.—Hydrographs for seven principal rivers of the United States, prepared by the Forecast Division.

Chart VI.—Surface temperatures; maximum, minimum, and mean of these. Lines of equal monthly mean temperature in red; lines of equal maximum temperature in black; and lines of equal minimum temperature (dotted) also in black.

Chart VII.—Percentage of sunshine. The average cloudiness at each Weather Bureau station is determined by numerous personal observations during the day. The difference between the observed cloudiness and 100, it is assumed, represents the percentage of sunshine, and the values thus obtained have been used in preparing Chart VII.

Chart VIII. Isobars and isotherms at 10,000 feet. The mean monthly station pressure for each station has been reduced to the 10,000-foot plane by entering Table 53, "Reduction of pressure to the sea level, the 3500 and 10,000-foot planes" pages 789–988, Barometry Report, with the temperature argument t corresponding to θ_2 and correcting the station pressure by the reduction $B_2 - B$ after applying the plateau correction, $C.\ \Delta\ \theta.\ H$, and the corrections for e and $\Delta\ A$, the argument t being the mean monthly air temperature. This reduction is fully described in Professor Bigelow's Report on the Barometry of the United States and Canada, pages 772 to 786 of the Annual Report of the Chief of Weather Bureau for 1900–1901, Volume II. The reduction for obtaining B_2 may also be found by using gradients from the station pressure to the height of 10,000 feet as set forth on pages 18 and 19, of the MONTHLY WEATHER REVIEW for January 1902.

The isotherms on the 10,000-foot plane have been computed by using the gradients for temperature for each month and station as shown by the Summary Table of Normals, Table 48, Chapter VIII, of Professor Bigelow's Report on the Barometry of the United States and Canada.

Chart IX.—Isobars and isotherms at 3500 feet. The pressure and temperature data entered on this chart are found by the method described for the same data on the 10,000 foot plane.

Chart X.—The total snowfall. This is based on the reports from regular and voluntary observers, and shows the depth of the snowfall during the month in inches. In general, the depth is shown by lines inclosing areas of equal snowfall, but in special cases figures are also given.

Chart XI.—Depth of snow on ground at the end of the month.

When there is no snow the last two charts may be replaced by others.

TABLE 1.—*Climatological data for Weather Bureau stations, June, 1903.*

Stations.	Elevation of instruments.			Pressure, in inches.			Temperature of the air, in degrees Fahrenheit.										Mean wet thermometer.	Mean temperature of the dew-point.	Mean relative humidity, per cent.	Precipitation, in inches.			Wind.					Clear days.	Partly cloudy days.	Cloudy days.	Average cloudiness, tenths.	Total snowfall.
	Barometer above sea level, feet.	Thermometers above ground.	Anemometer above ground.	Actual, reduced to mean of 24 hours.	Sea level, reduced to mean of 24 hrs.	Departure from normal.	Mean max. + mean min. ÷ 2.	Departure from normal.	Maximum.	Date.	Mean maximum.	Minimum.	Date.	Mean minimum.	Greatest daily range.					Total.	Departure from normal.	Days with .01, or more.	Total movement, miles.	Prevailing direction.	Maximum velocity. Miles per hour.	Maximum velocity. Direction.	Maximum velocity. Date.					
New England.							**57.8**	**— 5.4**											**83**	**5.16**	**+ 2.2**								**7.0**	
Eastport	76	69	82	29.92	30.00	+ .07	53.1	— 2.0	75	27	59	41	1	47	26	30	48	87	1.69	— 1.8	8	7,123	ne.	42	ne.	15	6	11	13	6.8	
Portland, Me.	103	81	117	29.86	29.99	+ .04	56.7	— 6.6	79	3	63	46	23	51	26	52	49	80	5.53	+ 2.2	10	6,365	s.	40	e.	12	6	6	18	7.0	
Concord	298	70	79	29.66	29.97	+ .01	58.8	— 6.5	83	3	68	38	5	50	40	...	...	...	7.75	+ 4.6	17	3,394	n.	32	e.	12	7	7	16	6.7	
Northfield	876	16	60	29.03	29.97	+ .01	57.5	— 6.1	83	6	69	31	1	46	43	53	49	75	4.75	+ 1.7	17	5,176	s.	32	s.	10	7	3	20	7.0	
Boston	125	115	181	29.83	29.97	+ .01	59.8	— 6.5	85	3	66	48	16	53	31	56	52	79	7.19	+ 4.1	14	6,976	e.	41	e.	12	6	2	22	7.6	
Nantucket	12	43	85	29.95	29.96	— .02	57.6	— 3.6	71	27	62	47	5	53	18	55	54	91	1.10	— 1.7	14	9,554	se.	48	se.	12	2	11	17	7.1	
Block Island	26	11	60	29.94	29.97	— .00	58.3	— 3.7	75	3	63	46	1	54	22	56	54	90	4.82	+ 2.2	15	10,272	se.	72	e.	12	4	9	17	6.9	
Narragansett	.....	10	38	.....	.....	.....	57.8	— 6.8	77	27	63	40	3	52	28	.....	.....	.....	6.22	+ 3.7	15	.....	e.	.....	.....	.....	8	3	19	.....	
New Haven	106	117	140	29.83	29.95	— .02	60.8	— 6.5	85	3	68	44	1	54	33	56	54	82	7.41	+ 4.5	15	6,094	ne.	41	e.	12	7	5	18	6.8	
Mid. Atlantic States.							**65.7**	**— 5.2**											**79**	**5.01**	**+ 1.4**								**6.6**	
Albany	97	102	115	29.84	29.95	— .02	63.2	— 5.8	86	3	71	45	1	55	33	58	54	78	6.44	+ 2.8	19	4,782	s.	26	se.	23	4	3	23	7.6	
Binghamton	875	79	90	29.01	29.93	— .04	61.0	— 5.3	84	30	71	41	1	51	36	...	...	...	5.79	+ 2.4	14	3,625	e.	24	w.	9	2	10	18	7.2	
New York	314	108	350	29.61	29.94	— .04	64.0	— 5.0	83	3	70	53	23	59	27	60	58	84	7.42	+ 4.3	17	6,924	e.	40	w.	30	3	7	20	7.6	
Harrisburg	374	94	104	29.53	29.93	— .06	65.1	— 5.4	86	4	72	49	1	58	29	59	56	75	5.63	+ 1.4	17	4,463	e.	24	w.	14	2	9	19	7.7	
Philadelphia	117	168	184	29.82	29.94	— .04	65.8	— 5.9	84	30	73	51	1	59	27	60	56	77	5.48	+ 2.4	12	6,460	se.	33	n.	12	3	7	20	7.5	
Scranton	805	111	119	29.09	29.93	— .05	63.2	.....	84	30	72	46	3	54	36	57	53	74	7.73	.....	15	3,932	ne.	20	s.	7	5	6	19	7.4	
Atlantic City	52	39	48	29.88	29.93	— .05	63.2	— 3.6	82	3	68	51	2	59	28	60	59	87	4.38	+ 1.2	14	5,680	s.	24	n.	15	5	13	12	6.0	
Cape May	17	47	51	29.94	29.95	— .03	64.2	— 4.0	79	4	69	53	1	60	19	60	...	...	4.48	+ 1.3	16	5,208	s.	28	s.	7	4	15	11	6.2	
Baltimore	123	69	117	29.79	29.92	— .07	67.2	— 6.3	88	30	74	53	13	60	26	62	59	76	5.01	+ 1.0	14	5,115	se.	26	n.	11	3	11	16	7.0	
Washington	112	59	76	29.81	29.93	— .07	67.0	— 6.2	87	30	73	48	3	59	31	62	60	81	3.60	— 0.4	16	4,133	s.	25	nw.	15	5	10	15	6.5	
Cape Henry	18	11	58	29.89	29.91	— .09	68.6	— 4.5	85	29	74	57	14	64	22	...	...	...	4.44	+ 0.5	14	9,179	ne.	36	nw.	15	6	9	15	6.8	
Lynchburg	681	83	88	29.19	29.92	— .09	68.8	— 5.4	88	30	78	50	3	60	32	62	59	74	4.10	+ 0.6	15	2,737	ne.	17	nw.	12	7	14	9	5.3	
Norfolk	91	102	111	29.84	29.93	— .07	70.3	— 4.8	91	30	78	54	13	63	26	64	62	79	3.40	— 0.8	12	6,218	s.	26	sw.	20	8	14	8	5.3	
Richmond	144	82	90	29.78	29.93	— .08	70.2	.....	90	30	79	52	13	62	28	...	...	...	5.73	.....	19	3,648	se.	20	sw.	14	6	9	15	6.5	
Wytheville	2,293	40	47	27.60	29.97	— .04	63.5	.....	85	30	73	45	18	54	32	58	56	82	3.67	.....	17	3,352	w.	28	nw.	14	11	13	6	4.7	
S. Atlantic States.							**73.4**	**— 3.2**											**78**	**5.71**	**+ 0.8**								**5.4**	
Asheville	2,255	53	75	27.65	29.94	— .07	64.6	— 5.0	85	19	74	41	14	55	31	59	57	80	5.55	+ 1.5	17	4,586	nw.	34	e.	1	7	15	8	5.4	
Charlotte	773	68	76	29.11	29.93	— .08	71.8	— 4.0	90	30	80	49	13	63	25	65	61	75	5.35	+ 0.8	13	4,267	ne.	22	nw.	22	12	9	9	5.0	
Hatteras	11	12	47	29.93	29.94	— .07	73.4	— 0.6	85	21	78	60	17	68	17	69	67	84	3.35	— 1.2	13	9,699	sw.	37	sw.	21	9	10	11	5.5	
Kittyhawk	8	12	30	.....	.....	.....	70.2	— 4.0	87	30	76	58	13	64	20	...	...	...	6.09	+ 1.5	9	8,919	sw.	.....	.....	.....	12	5	13	5.3	
Raleigh	376	93	101	29.53	29.91	— .10	72.0	— 3.7	92	30	81	50	13	63	27	65	62	74	4.61	+ 0.7	14	4,164	sw.	20	nw.	18	11	11	8	5.3	
Wilmington	78	82	90	29.83	29.91	— .10	74.2	— 2.5	89	21	82	55	13	67	22	68	65	80	8.63	+ 2.9	14	5,750	sw.	25	nw.	18	6	12	12	6.4	
Charleston	48	14	92	29.90	29.94	— .07	76.8	— 2.3	91	24	83	60	13	70	22	70	68	77	4.64	— 1.0	17	7,630	s.	31	e.	18	2	26	2	5.5	
Columbia, S. C.	351	114	122	29.56	29.93	— .08	74.2	— 4.8	91	21	83	53	13	65	25	67	64	78	9.97	+ 5.8	18	4,920	sw.	40	w.	26	11	8	11	5.6	
Augusta	180	89	97	29.73	29.92	— .09	75.0	— 3.8	92	21	84	52	13	66	28	68	64	74	5.35	+ 0.8	12	3,862	se.	30	n.	11	14	12	4	4.2	
Savannah	65	79	89	29.87	29.93	— .08	77.0	— 2.3	93	21	85	59	14	69	26	70	67	79	6.01	— 0.6	17	5,214	sw.	31	ne.	8	7	19	4	4.9	
Jacksonville	43	101	129	29.88	29.93	— .08	77.9	— 2.2	90	16	86	62	13	70	21	70	68	77	3.22	— 2.2	10	6,559	sw.	41	s.	11	3	20	7	6.1	
Florida Peninsula.							**80.3**	**— 0.2**											**78**	**5.71**	**— 0.9**								**5.4**	
Jupiter	28	10	48	29.93	29.95	— .06	79.5	+ 0.5	90	11	85	70	29	74	18	74	72	80	7.01	+ 0.5	18	6,735	s.	30	s.	21	3	20	7	6.3	
Key West	22	10	53	29.92	29.94	— .05	82.2	— 0.3	91	24	88	69	26	77	19	75	73	76	4.74	+ 0.7	11	5,329	se.	45	nw.	26	8	14	8	5.4	
Sand Key	24	.....	.....	.....	.....	.....	81.0	.....	93	14	85	69	26	77	16	...	...	...	2.91	.....	11	7,598	se.	39	se.	30	10	14	6	5.0	
Tampa	34	60	67	29.91	29.93	— .08	79.2	— 0.8	94	18	88	66	3	71	24	72	70	78	5.38	— 3.8	11	4,338	e.	30	se.	29	11	15	4	4.7	
East Gulf States.							**74.7**	**— 4.1**											**75**	**3.34**	**— 1.4**								**5.4**	
Atlanta	1,174	190	216	28.72	29.94	— .07	71.4	— 4.3	89	21	80	46	13	63	23	64	60	74	6.65	+ 2.7	13	7,054	nw.	56	n.	20	8	12	10	5.7	
Macon	370	93	99	29.54	29.92	— .09	75.0	.....	93	19	85	51	13	65	30	...	...	...	3.53	.....	13	3,633	s.	24	se.	9	9	7	14	5.8	
Pensacola	56	79	96	29.88	29.94	— .05	75.8	— 3.6	87	18	81	60	13	70	19	...	...	...	3.28	— 2.1	9	6,856	sw.	38	w.	26	11	12	7	5.1	
Mobile	57	88	96	29.88	29.94	— .05	76.2	— 3.5	91	18	83	59	13	69	22	69	66	76	2.65	— 3.2	12	4,786	sw.	23	sw.	26	8	13	9	5.3	
Montgomery	223	100	112	29.69	29.92	— .08	74.9	— 4.5	93	19	84	53	13	66	27	68	65	77	5.63	+ 1.0	11	3,924	n.	32	w.	26	9	12	9	5.4	
Meridian	375	84	93	29.54	29.92	— .06	73.2	— 4.4	92	19	83	51	2	63	34	...	...	...	3.24	— 3.0	14	3,243	ne.	32	nw.	25	10	13	7	4.9	
Vicksburg	247	62	74	29.64	29.90	— .07	73.8	— 5.4	91	19	83	52	2	65	24	66	62	71	1.80	— 2.5	9	3,966	ne.	24	n.	26	9	12	9	5.2	
New Orleans	51	88	121	29.88	29.92	— .06	77.4	— 2.9	93	19	85	60	13	70	22	70	67	76	3.61	— 3.0	14	5,358	sw.	33	nw.	26	5	13	12	6.2	
West Gulf States.							**74.2**	**— 4.3**											**74**	**3.18**	**— 0.7**								**4.7**	
Shreveport	249	77	84	29.68	29.94	— .02	74.3	— 5.6	96	20	84	53	1	64	29	66	61	68	1.55	— 2.2	11	3,887	ne.	32	nw.	19	9	12	9	5.4	
Fort Smith	457	79	94	29.47	29.94	— .00	71.4	— 4.7	92	20	81	50	1	62	27	64	59	69	1.37	— 3.0	6	4,216	e.	31	se.	24	3	25	2	4.8	
Little Rock	357	93	100	29.58	29.94	— .02	71.6	— 5.4	92	20	80	53	1	64	24	64	59	70	0.76	— 3.6	11	3,761	nw.	26	s.	21	11	15	4	4.2	
Corpus Christi	20	48	53	29.89	29.92	+ .01	77.3	— 2.6	90	24	83	59	14	71	21	72	70	82	6.48	+ 3.8	10	7,242	se.	34	ne.	13	12	10	8	4.7	
Fort Worth	670	106	114	29.28	29.98	+ .06	73.3	.....	94	18	83	48	1	63	29	...	...	...	4.84	.....	9	5,415	w.	56	nw.	24	15	11	4	4.2	
Galveston	54	106	112	29.86	29.91	— .04	76.0	— 5.6	88	17	81	57	14	71	17	70	68	80	3.14	— 1.7	7	7,438	s.	42	ne.	13	15	7	8	4.5	
Palestine	510	73	79	29.42	29.94	— .00	73.2	— 5.0	91	20	82	48	1	65	23	66	63	76	4.19	— 0.1	11	3,908	ne.	37	nw.	25	6	16	8	5.6	
San Antonio	701	80	91	29.20	29.91	+ .01	75.8	— 4.9	99	24	86	54	13	66	28	68	63	71	4.75	+ 2.1	8	4,709	se.	44	n.	22	13	10	7	4.5	
Taylor	583	55	63	29.33	29.94	+ .02	75.0	.....	93	21	85	51	1	65	28	...	...	...	3.08	.....	9	4,951	n.	50	nw.	22	11	10	9	4.8	
Ohio Val. and Tenn.							**68.4**	**— 5.6**											**74**	**3.81**	**— 0.5**								**5.6**	
Chattanooga	762	106	112	29.16	29.96	— .04	70.8	— 4.4	88	30	80	49	13	61	31	63	59	73	3.90	— 0.6	13	4,404	w.	47	w.	22	10	14	6	5.0	
Knoxville	1,004	35	88	28.90	29.94	— .06	69.1	— 4.5	87	30	79	42	13	59	30	63	60	78	3.39	— 0.7	12	4,284	sw.	30	nw.	6	9	14	7	5.3	
Memphis	397	140	154	29.54	29.96	— .01	71.8	— 6.3	91	21	79	54	13	64	23	66	62	75	1.87	— 2.8	7	4,963	nw.	36	nw.	22	15	8	7	4.7	
Nashville	546	122	134	29.38	29.96	— .03	70.4	— 6.2	89	30	80	47	13	61	29	64	61	75	7.58	+ 3.3	10	3,818	nw.	29	s.	1	14	11	5	4.2	
Lexington	989	75	102	28.89	29.93	— .07	67.7	— 5.9	87	30	76	42	12	59	26	...	...	...	2.71	— 1.5	15	6,106	nw.	30	nw.	6	9	9	12	5.4	
Louisville	525	114	136	29.38	29.96	— .02	70.0	— 5.1	90	30	79	44	12	61	27	62	57	69	3.52	— 0.8	10	5,072	n.	25	w.	14	11	11	8	4.8	
Evansville	431	72	82	29.47	29.93	— .04	69.8	.....	88	30	79	44	12	61	27	...	...	...	2.52	.....	9	4,258	n.	30	s.	1	9	12	9	4.9	
Indianapolis	822	154	164	29.08	29.96	— .01	66.4	— 6.1	87	30	75	42	12	57	28	60	56	74	3.19	— 1.5	10	6,385	n.	29	w.	23	3	18	9	6.1	
Cincinnati	628	152	160	29.27	29.94	— .05	67.6	— 6.2	88	30	76	44	12	59	25	61	57	72	3.27	— 1.1	14	4,726	ne.	26	w.	14	5	13	12	6.3	
Columbus	824	173	190	29.07	29.94	— .05	66.0	— 5.3	87	30	75	46	13	57	27	59	55	74	3.07	— 0.4	13	7,088	sw.	38	nw.	16	8	8	14	6.4	
Pittsburg	842	116	123	29.04	29.93	— .06	65.8	— 5.8	85	9	74	48	13	58	26	59	55	72	5.27	+ 1.8	15	3,839	nw.	30	sw.	23	4	15	11	6.6	
Parkersburg	638	77	84	29.28	29.95	— .05	66.9	— 5.6	88	30	76	47	13	58	30	61	57	73	4.13	— 0.8	11	2,838	n.	20	w.	13	5	15	10	5.6	
Elkins	1,940	41	50	27.93	29.95	— .05	61.3	.....	82	30	72	40	18	51	37	56	54	82	5.51	.....	18	2,396	n.	16	nw.	14	2	14	14	7.1	
Lower Lake Region.							**62.4**	**— 4.7**											**77**	**4.35**	**+ 0.7**								**5.8**	
Buffalo	767	178	206	29.10	29.91	— .06	62.4	— 2.6	82	6	68	49	1	56	26	58	55	79	3.95	+ 0.4	12	7,505	sw.	32	s.	23	5	15	10	6.6	
Oswego	335	76	91	29.56	29.92	— .05	60.0	— 4.0	83	9	67	47	1	53	26	55	52	79	5.57	+ 2.2	15	5,790	se.	23	se.	23	10	15	5	4.8	
Rochester	523	81	102	29.37	29.93	— .04	62.9	— 3.5	87	9	71	42	1	54	34	57	53	76	3.66	+ 0.4	13	4,693	se.	20	se.	23	5	11	14	6.1	
Syracuse	597	97	113	29.29	29.93	— .04	61.7	.....	84	30	70	45	1	54	29	...	...	...	5.80	.....	16	6,331	s.	34	sw.	30	7	12	11	6.2	
Erie	713	92	102	29.16	29.94	— .04	61.8	— 5.2	80	30	68	49	1	56	20	57	54	77	4.50	+ 0.6	16	5,901	w.	26	se.	22	13	10	7	5.2	
Cleveland	762	190	201	29.12	29.93	— .05	62.2	— 5.6	84	30	68	48	11	56	24	57	53	75	3.17	— 0.6	17	8,734	n.	47	w.	13	8	9	13	6.2	
Sandusky	629	62	70	29.26	29.94	— .04	63.6	— 5.4	89	30	70	48	13	57	31	...	...	...	3.79	— 0.1	16	5,520	e.	29	w.	9	15	4	11	5.0	
Toledo	628	120	127	29.26	29.94	— .03	63.4	— 6.4	88	30	71	47	12	56	28	57	53	72	3.87	+ 0.4	17	6,175	ne.	31	sw.	8	10	10	10	5.7	
Detroit	730	153	193	29.15	29.94	— .03	62.8	— 5.1	86	30	70	47	12	55	24	58	55	78	6.32	+ 2.6	16	7,107	ne.	30	sw.	23	5	13	12	6.5	
Upper Lake Region.							**59.3**	**— 3.0**											**71**	**1.72**	**— 2.0**								**5.2**	
Alpena	609	63	80	29.30	29.96	.00	57.3	— 3.0	81	3	66	38	12	48	34	53	49	73	2.57	— 1.2	7	5,705	nw.	31	nw.	17	8	10	12	5.8	
Escanaba	612	43	57	29.32	29.98	+ .04	58.2	— 2.3	79	28	67	37	12	49	32	53	48	71	1.13	— 2.6	6	5,651	n.	28	nw.	23	11	10	9	4.9	
Grand Haven	632	54	92	29.27	29.95	— .01	59.8	— 4.6	82	4	68	39	11	52	30	55	51	74	2.40	— 1.5	9	6,576	w.	40	sw.	30	10	10	10	5.6	
Houghton	668	66	74	29.27	30.00	+ .06	58.5	.....	84	7	70	35	12	47	34	...	...	...	0.60	.....	6	4,331	e.	24	n.	23	16	9	5	3.7	
Marquette	734	79	116	29.21	30.02	+ .08	56.4	— 2.6	86	7	64	38	10	49	28	50	45	67	2.16	— 1.4	11	5,131	nw.	28	nw.	7	11	8	11	5.4	
Port Huron	638	70	120	29.27	29.96	— .01	60.2	— 3.9	84	8	68	46	15	52	28	56	52	77	2.47	— 1.0	12	6,688	ne.	31	n.	12	4	13	13	6.6	
Sault Ste. Marie	614	40	61	29.28	29.94	— .02	57.5	— 2.7	81	30	68	40	11	47	35	51	45	65	1.49	— 1.6	7	5,227	nw.	32	nw.	11	16	7	7	3.8	
Chicago	823	241	274	29.10	29.98	+ .02	61.2	— 5.5	90	30	68	44	12	55	23	55	50	71	1.62	— 2.2	8	9,729	ne.	35	e.	2	5	20	5	5.6	
Milwaukee	681	124	142	29.25	29.98	+ .03	61.5	— 1.8	86	29	70	42	12	53	28	56	53	77	1.51	— 2.6	10	6,386	n.	34	ne.	2	12	10	8	4.8	
Green Bay	617	49	86	29.31	29.98	+ .03	62.2	— 4.5	86	27	73	36	11	52	34	56	52	71	1.03	— 2.6	7	6,178	ne.	31	w.	30	7	11	12	6.3	
Duluth	702	95	116	29.24	30.00	+ .08	59.0	+ 1.2	83	7	68	40	10	50	32	52	47	68	0.79	— 3.8	10	5,928	ne.	30	nw.	13	14	13	3	4.4	

TABLE I.—*Climatological data for Weather Bureau stations, June, 1903*—Continued.

Stations.	Elevation of instruments.			Pressure, in inches.			Temperature of the air, in degrees Fahrenheit.										Mean wet thermometer.	Mean temperature of the dew-point.	Mean relative humidity, per cent.	Precipitation, in inches.			Wind.					Clear days.	Partly cloudy days.	Cloudy days.	Average cloudiness, tenths.	Total snowfall.
	Barometer above sea level, feet.	Thermometers above ground.	Anemometer above ground.	Actual, reduced to mean of 24 hours.	Sea level, reduced to mean of 24 hrs.	Departure from normal.	Mean max. + mean min. ÷ 2.	Departure from normal.	Maximum.	Date.	Mean maximum.	Minimum.	Date.	Mean minimum.	Greatest daily range.					Total.	Departure from normal.	Days with .01, or more.	Total movement, miles.	Prevailing direction.	Maximum velocity. Miles per hour.	Maximum velocity. Direction.	Maximum velocity. Date.					
North Dakota.							**63.0**	**— 1.0**											**64**	**1.43**	**— 2.4**									**4.2**	
Moorhead	935	54	60	29.01	30.01	+ .11	63.0	— 1.8	85	14	76	36	11	50	34	56	49	63	0.80	— 3.6	7	5,838	se.	30	ne.	30	17	10	3	3.4	
Bismarck	1,674	16	29	28.26	30.02	+ .15	63.8	0.0	92	17	76	38	10	52	38	56	50	64	1.44	— 2.1	8	6,414	s.	33	n.	19	15	11	4	4.1	
Williston	1,875	14	44	28.00	29.96	+ .10	62.2	— 1.1	85	17	74	30	10	50	39	54	49	67	2.06	— 1.4	10	6,726	se.	40	ne.	14	11	8	11	5.2	
Upper Miss. Valley.							**66.7**	**— 4.5**											**70**	**2.34**	**— 2.2**									**4.8**	
Minneapolis		99	208				65.4	— 3.4	85	29	74	40	11	56	26					1.02	— 2.8	6	6,704	ne.	40	ne.	30	6	17	7		
St. Paul	837	102	122	29.09	29.99	+ .07	65.4	— 1.8	85	6	74	41	11	56	26	57	51	64	1.16	— 3.2	7	4,188	nw.	30	nw.	8	16	8	6	4.2	
La Crosse	714	71	87	29.24	30.01	+ .08	65.2	— 3.7	84	15	75	40	12	55	31				1.88	— 2.6	8	4,413	s.	37	s.	30	14	12	4	4.3	
Davenport	606	71	79	29.31	29.95	+ .01	66.1	— 4.8	91	30	75	41	12	57	28	60	57	74	2.28	— 2.1	6	4,605	w.	21	ne.	1	13	7	10	5.0	
Des Moines	861	84	99	29.08	30.00	+ .08	65.8	— 4.3	92	30	75	43	12	57	29	59	55	71	3.06	— 2.3	12	4,522	sw.	28	w.	8	5	17	8	5.8	
Dubuque	698	100	117	29.24	29.99	+ .06	64.6	— 4.9	87	30	74	40	12	55	30	58	53	68	2.16	— 3.0	11	3,735	nw.	22	nw.	8	14	8	8	4.9	
Keokuk	614	63	78	29.30	29.94	.00	67.0	— 5.5	91	30	76	44	12	58	26	60	57	75	1.40	— 3.1	8	4,140	nw.	20	nw.	8	11	16	3	3.9	
Cairo	356	87	93	29.58	29.95	— .02	69.8	— 5.6	88	30	78	50	12	62	23	64	61	76	2.37	— 2.1	8	4,782	nw.	28	s.	21	9	10	11	5.4	
Springfield, Ill.	644	82	93	29.28	29.96	+ .01	67.0	— 5.2	89	30	77	43	12	57	26	60	55	71	2.13	— 2.3	11	5,515	nw.	29	e.	21	11	10	9	5.0	
Hannibal	534	75	110	29.39	29.96	+ .01	67.4	— 5.0	90	30	76	43	12	58	28				2.59	— 0.8	9	4,951	sw.	27	w.	21	12	13	5	4.5	
St. Louis	567	111	210	29.35	29.95	.00	70.4	— 4.8	90	30	78	50	12	63	22	61	55	63	5.71	+ 0.6	8	5,878	nw.	28	n.	8	12	10	8	4.6	
Missouri Valley.							**66.7**	**— 4.0**											**69**	**2.95**	**— 1.4**									**4.9**	
Columbia, Mo	784	11	84	29.14	29.96	+ .01	66.4	— 7.9	90	30	77	42	13	56	32				2.16	— 2.7	13	3,639	n.	27	nw.	18	7	10	13	6.2	
Kansas City	963	78	95	28.98	30.00	+ .08	69.0	— 4.4	92	30	77	48	1	61	25	61	56	69	2.35	— 2.6	10	4,013	n.	25	s.	30	12	8	10	4.8	
Springfield, Mo	1,324	98	104	28.59	29.98	+ .03	67.2	— 5.2	87	30	75	47	13	59	23	61	57	75	3.99	— 0.5	9	4,845	n.	25	e.	25	22	4	4	3.4	
Topeka		81	89				68.2	— 5.0	94	30	78	46	1	58	29				4.91	+ 0.1	10	4,512	n.	27	s.	30	10	14	6	5.0	
Lincoln	1,189	75	84	28.72	29.96	+ .06	66.4	— 4.7	95	30	76	44	11	57	29	59	55	71	2.60	— 1.6	11	5,916	s.	38	nw.	8	10	13	7	4.7	
Omaha	1,105	115	121	28.82	29.98	+ .07	67.6	— 3.9	95	30	76	48	1	59	24	61	56	72	1.31	— 4.4	11	4,950	n.	36	n.	8	14	11	5	4.4	
Valentine	2,598	47	54	27.28	29.96	+ .10	63.8	— 3.4	92	28	75	37	10	52	34	56	50	64	1.43	— 2.0	11	7,411	s.	50	nw.	23	12	12	6	4.5	
Sioux City	1,135	96	164	28.80	30.00	+ .10	65.9	— 4.4	93	30	76	40	11	56	30				5.65	+ 1.8	13	6,701	ne.	66	nw.	8	8	15	7	5.4	
Pierre	1,572	43	50	28.34	29.98	+ .11	68.0	— 0.2	94	17	80	43	10	56	34	58	50	60	2.14	— 1.3	8	5,636	se.	32	n.	29	5	13	12	6.3	
Huron	1,306	56	67	28.62	30.00	+ .12	63.9	— 2.8	87	17	77	35	11	51	41	57	52	68	2.54	— 1.0	7	6,748	se.	46	nw.	18	9	12	9	5.6	
Yankton	1,233	42	49	28.69	30.00	+ .11	66.8	— 1.8	93	29	78	38	11	56	34				3.35	— 0.9	12	4,002	e.	37	n.	19	14	12	4	4.1	
Northern Slope.							**62.8**	**— 0.2**											**64**	**2.10**	**— 0.5**									**4.8**	
Havre	2,505	46	53	27.37	29.98	+ .13	64.0	+ 2.7	90	17	77	38	9	51	43	55	48	62	1.51	— 1.5	8	6,543	e.	48	sw.	17	13	14	3	4.1	
Miles City	2,371	42	50	27.46	29.92	+ .07	68.4	+ 1.4	100	17	81	40	19	56	36	62	59	75	0.94	— 2.1	8	4,681	se.	34	nw.	30	18	8	4	3.6	
Helena	4,110	88	94	25.84	29.97	+ .09	63.1	+ 3.7	84	17	74	41	10	52	36	50	40	49	1.09	— 1.3	10	5,844	sw.	29	w.	22	14	9	7	4.7	
Kalispell	2,965	45	51	26.93	29.95	+ .06	61.4	.....	88	11	74	41	10	49	45	51	44	60	1.61	.....	9	4,060	w.	24	w.	2	18	9	3	3.4	
Rapid City	3,234	46	50	26.65	29.96	+ .11	62.5	— 1.7	92	28	73	36	10	52	35	55	50	67	3.79	— 0.1	7	5,231	w.	34	w.	7	11	10	9	5.1	
Cheyenne	6,088	56	64	24.09	29.98	+ .14	56.9	— 4.0	88	28	68	30	1	46	35	49	43	67	1.42	— 0.1	10	6,072	s.	33	nw.	21	3	12	15	7.0	
Lander	5,372	26	36	24.70	29.97	+ .12	60.8	+ 0.7	89	28	75	37	11	46	42	50	43	60	1.99	+ 0.8	7	2,329	nw.	30	w.	20	8	15	7	5.3	
North Platte	2,821	43	52	27.12	30.01	+ .15	63.9	— 4.0	91	18	75	43	1	52	32	58	54	73	3.99	+ 0.6	12	5,062	se.	49	n.	17	6	19	5	5.6	
Middle Slope.							**66.5**	**— 5.0**											**69**	**2.12**	**+ 0.8**									**5.7**	
Denver	5,291	79	151	24.79	29.99	+ .15	62.5	— 3.9	95	28	74	41	11	51	37	52	46	64	1.62	+ 0.2	12	4,750	ne.	29	sw.	28	5	13	12	6.3	
Pueblo	4,685	80	86	25.33	29.97	+ .14	63.9	— 4.4	98	29	75	42	1	52	36	54	48	66	3.24	+ 2.0	13	4,167	se.	28	nw.	28	3	16	11	6.4	
Concordia	1,398	42	47	28.54	29.99	+ .09	67.4	— 4.9	96	30	78	43	11	57	29	61	58	75	3.97	— 0.2	12	3,709	n.	24	s.	30	5	19	6	5.7	
Dodge	2,509	44	54	27.43	30.00	+ .13	65.8	— 6.8	97	29	77	41	11	55	32	59	55	71	1.49	— 1.8	8	6,500	s.	36	nw.	18	8	6	16	6.5	
Wichita	1,358	78	86	28.58	30.00	+ .09	68.9	— 5.0	94	29	79	46	1	59	26	61	57	70	1.26	— 3.7	9	4,684	ne.	28	sw.	30	13	12	5	4.9	
Oklahoma	1,214	79	86	28.70	29.95	+ .04	70.5	— 5.3	91	19	80	48	1	61	25	62	57	66	1.15	— 1.6	4	5,937	s.	36	e.	24	11	17	2	4.3	
Southern Slope.							**68.8**	**— 6.6**											**73**	**3.35**	**+ 0.2**									**6.2**	
Abilene	1,738	45	54	28.17	29.95	+ .07	71.8	— 6.6	101	24	82	53	1	62	31	64	60	72	3.87	+ 0.6	15	4,587	se.	47	nw.	22	8	7	15	6.3	
Amarillo	3,676	10	49	26.27	29.95	+ .10	65.8	— 6.6	94	29	75	46	2	57	30	58	54	74	2.83	— 0.2	12	7,624	se.	50	nw.	19	4	18	8	6.0	
Southern Plateau.							**73.3**	**— 2.0**											**37**	**1.41**	**+ 1.1**									**3.0**	
El Paso	3,762	10	110	26.13	29.80	+ .05	75.4	— 4.8	102	29	88	51	12	63	37	57	44	45	2.50	+ 2.1	9	7,220	e.	59	ne.	1	17	11	2	2.8	
Santa Fe	7,013	47	50	23.32	29.89	+ .08	61.2	— 3.9	89	28	72	42	13	51	28	49	41	57	3.87	+ 2.9	15	4,251	e.	27	s.	9	15	9	6	4.4	
Flagstaff	6,907	12	25	23.38	29.83	+ .05	57.7	— 4.5	86	29	75	32	15	41	45	46	.....	.....	1.88	+ 1.5	9	.....	sw.	.....	.....	.....	11	12	7	4.3	
Phoenix	1,108	50	56	28.63	29.75	+ .01	85.4	+ 1.5	111	28	101	62	4	69	39	59	37	23	0.18	+ 0.1	2	3,691	e.	30	e.	5	26	3	1	1.4	
Yuma	141	16	50	29.59	29.72	— .02	85.2	— 0.4	112	28	101	60	4	69	40	64	50	39	0.00	0.0	0	4,036	sw.	30	e.	12	28	2	0	0.5	
Independence	3,910	51	58	25.91	29.82	+ .04	75.0	— 0.4	99	28	87	53	16	63	28	52	31	23	0.02	0.0	1	6,393	nw.	36	se.	14	17	5	8	4.3	
Middle Plateau.							**67.3**	**+ 1.7**											**41**	**0.68**	**+ 0.1**									**3.5**	
Carson City	4,720	82	92	25.27	29.90	+ .04	62.4	+ 1.2	88	27	77	35	3	47	40	48	37	44	T.	— 0.4	0	4,752	nw.	30	ne.	8	20	7	3	2.8	
Winnemucca	4,344	59	70	25.58	29.89	+ .01	65.4	+ 3.0	91	27	81	36	3	50	42	51	40	46	0.74	0.0	5	6,190	ne.	31	sw.	14	16	8	6	3.9	
Modena	5,479	10	43	24.60	29.83	+ .01	65.7	.....	94	28	83	41	16	49	45	47	27	31	0.13	.....	5	8,060	sw.	43	sw.	29	21	7	2	2.6	
Salt Lake City	4,366	105	110	25.57	29.85	.00	70.4	+ 3.5	91	28	82	54	4	59	31	54	41	38	0.74	0.0	2	4,779	se.	34	e.	16	14	14	2	4.1	
Grand Junction	4,608	43	51	25.35	29.87	+ .04	70.9	— 0.9	99	29	84	51	4	57	37	55	43	46	1.22	+ 0.9	9	3,823	se.	22	sw.	3	12	14	4	4.3	
Northern Plateau.							**68.0**	**+ 5.0**											**53**	**0.96**	**— 0.3**									**4.7**	
Baker City	3,471	53	59	26.43	29.96	+ .01	64.0	+ 7.3	86	8	76	40	3	52	35	52	43	56	1.29	— 0.2	11	3,808	nw.	33	sw.	14	7	11	12	5.9	
Boise	2,739	61	68	27.10	29.91	.00	70.6	+ 4.9	92	15	84	48	5	57	36	55	44	46	0.43	— 0.4	7	3,463	w.	31	se.	2	10	14	6	5.0	
Lewiston	757	52	61	29.14	29.93	— .01	71.8	+ 6.0	99	11	85	49	5	58	43	.....	.....	.....	1.09	+ 0.1	9	2,326	e.	26	w.	16	15	12	3	3.6	
Pocatello	4,482	46	54	25.47	29.91	+ .04	65.3	+ 3.3	87	27	79	42	24	52	36	54	46	54	0.82	— 0.3	5	5,464	e.	28	sw.	2	13	16	1	4.1	
Spokane	1,929	101	110	27.94	29.97	+ .03	66.6	+ 4.2	91	11	78	45	5	55	39	53	43	50	1.35	— 0.3	5	5,106	s.	30	sw.	27	7	11	12	6.1	
Walla Walla	1,000	65	71	28.88	29.94	— .02	69.7	+ 4.1	96	8	83	47	3	57	38	59	52	58	0.79	— 0.6	6	4,062	s.	38	ne.	15	19	11	0	3.4	
N. Pac. Coast Reg.							**59.2**	**+ 1.6**											**77**	**2.37**	**+ 0.2**									**6.9**	
North Head	211	11	56	29.82	30.04	+ .05	56.0	+ 0.5	96	7	60	44	3	52	29	53	51	87	3.21	+ 0.6	16	11,393	nw.	54	se.	26	3	9	18	7.4	
Port Crescent	259	12	29	29.76	30.01	— .02	54.2	+ 0.5	81	7	60	36	3	48	32	.....	.....	.....	1.67	+ 0.1	12	3,227	w.	14	e.	6	5	15	10	6.3	
Seattle	123	114	151	29.91	30.04	+ .04	61.9	+ 1.9	96	8	70	46	3	54	38	55	50	70	1.55	0.0	9	4,637	se.	29	sw.	22	8	12	10	5.7	
Tacoma	213	113	120	29.80	30.02	— .01	60.8	+ 2.6	97	8	69	42	3	52	39	.....	.....	.....	2.59	0.0	13	3,722	n.	22	n.	14	5	5	20	7.4	
Tatoosh Island	86	7	57	29.92	30.02	.00	54.3	+ 0.8	84	8	59	43	3	50	34	51	50	91	4.86	+ 0.8	18	8,925	sw.	56	e.	7	3	4	23	8.1	
Portland, Oreg	154	68	96	29.85	30.01	— .03	64.2	+ 2.6	97	7	73	45	3	55	35	56	51	67	2.00	+ 0.2	12	3,680	nw.	22	se.	15	6	12	12	6.5	
Roseburg	518	56	67	29.46	30.02	— .01	63.1	+ 2.1	101	7	74	38	3	52	45	55	50	71	0.74	— 0.6	11	2,687	nw.	17	ne.	5	7	7	16	6.6	
Mid. Pac. Coast Reg.							**63.3**	**+ 1.4**											**62**	**0.12**	**— 0.4**									**3.3**	
Eureka	62	62	80	29.99	30.06	+ .01	56.2	+ 1.2	85	6	61	41	3	51	33	52	49	82	0.57	— 0.6	6	5,000	n.	35	nw.	5	8	7	15	6.1	
Mount Tamalpais	2,375	11	18	27.51	29.95	.00	64.2	.....	95	6	72	40	2	56	24	50	37	44	T.	.....	0	17,003	nw.	68	nw.	20	22	7	1	2.2	
Red Bluff	332	50	56	29.52	29.88	.00	76.6	+ 2.0	105	7	90	50	17	63	35	61	50	46	0.01	— 0.5	1	4,126	se.	24	se.	11	21	8	1	2.4	
Sacramento	69	106	117	29.80	29.87	— .02	71.0	+ 2.4	101	7	85	48	3	57	36	59	51	57	T.	— 0.2	0	6,521	s.	30	sw.	1	20	10	0	2.5	
San Francisco	155	161	167	29.80	29.97	+ .01	58.5	+ 0.1	96	6	65	48	3	52	35	53	50	80	T.	— 0.2	0	10,725	w.	40	w.	25	18	10	2	2.7	
Point Reyes Light	490	7	50	29.40	29.92	.....	54.2	+ 1.2	87	6	59	46	1	49	28	.....	.....	.....	0.00	— 0.4	0	22,374	nw.	75	nw.	30	11	11	8	4.8	
Southeast Farallon	30	9	17	.....	.....	.....	53.2	.....	63	6	55	48	4	51	9	.....	.....	.....	0.01	.....	1	14,681	nw.	45	nw.	26	23	4	3	2.5	
S. Pac. Coast Reg.							**67.5**	**+ 1.0**											**68**	T.	**— 0.1**									**3.8**	
Fresno	330	67	70	29.51	29.85	.00	77.2	+ 3.2	107	27	93	49	3	61	40	58	43	37	T.	— 0.1	0	4,798	nw.	34	nw.	7	22	6	2	3.3	
Los Angeles	338	116	123	29.54	29.91	+ .01	66.3	+ 0.6	84	5	75	49	3	57	29	59	56	79	0.02	— 0.1	1	3,613	sw.	19	w.	5	6	23	1	5.1	
San Diego	87	94	102	29.81	29.90	— .02	63.2	— 0.9	74	5	68	54	15	59	16	59	57	83	T.	— 0.1	0	4,003	sw.	20	nw.	16	17	9	4	4.1	
San Luis Obispo	201	46	48	29.75	29.96	+ .01	63.4	+ 1.0	98	26	76	45	2	50	45	54	49	71	T.	— 0.1	0	3,933	w.	19	n.	17	20	7	3	2.8	
West Indies.																															
Bridgetown	30	57	65	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	
Grand Turk	11	6	20	29.98	29.99	— .02	82.4	.....	91	20	89	70	18	76	19	.....	.....	.....	3.57	.....	9	.....	e.	.....	.....	.....	15	12	3	4.3	
Havana	57	87	105	29.88	29.94	— .01	79.5	— 1.7	91	25	86	69	3	73	18	.....	.....	.....	6.28	— 0.9	12	6,248	e.	37	ne.	3	5	21	4	5.5	
San Juan	82	48	90	29.90	29.98	— .01	81.8	+ 1.3	93	16	88	71	25	76	16	76	74	78	2.18	— 2.7	11	7,824	e.	36	e.	26	15	10	5	4.2	

NOTE.—The data at stations having no departures are not used in computing the district averages. • More than one date.

TABLE II.—*Climatological record of voluntary and other cooperating observers, June, 1903.*

Stations.	Temperature. (Fahrenheit.)			Precipitation.	
	Maximum.	Minimum.	Mean.	Rain and melted snow.	Total depth of snow.
Alabama.	°	°	°	*Ins.*	*Ins.*
Anniston	89	44	70.2	2.89	
Ashville	90	44	71.1	2.88	
Benton				5.25	
Bermuda	98	54	75.5	3.99	
Bridgeport				4.08	
Burkeville				5.15	
Calera				3.86	
Camphill	92	51	73.4	6.38	
Citronelle	94	55	76.2	6.37	
Clanton	91	51	72.0	5.54	
Cordova	93	46	73.2	2.87	
Daphne	94	58	76.8	2.07	
Decatur	95	47	72.2	2.19	
Demopolis				5.24	
Dothan	95	55	77.4	7.30	
Eufaula	93	54	75.3	2.66	
Eutaw	95[c]	51[c]	76.3[c]	4.35	
Evergreen	95	54	75.8	6.80	
Flomaton	94	54	75.6	9.70	
Florence *a*				9.70	
Florence *b*	91	44	70.5	9.31	
Fort Deposit	94	52	74.6	5.50	
Gadsden	93	47	72.8	4.68	
Goodwater	92	48	72.2	4.90	
Greensboro	92	50	73.4	5.84	
Greenville				3.37	
Haleysville	92	48	72.1	3.30	
Hamilton	92	45	70.9	4.76	
Helena				3.25	
Highland Home	92	52	74.2	5.75	
Letohatchie				4.94	
Livingston	94	52	73.6	9.17	
Lock No. 4	93	46	72.7	2.05	
Madison Station	98	45	72.6	8.91	
Maplegrove	95	43	71.6	2.78	
Marion	97	50	74.8	5.34	
Milstead				4.98	
Newbern	98	49	75.2	6.17	
Notasulga				5.69	
Oneonto	88	45	70.3	3.29	
Opelika	94	49	73.8	5.31	
Ozark	96	52	76.2	6.78	
Prattville	93	48	73.5	5.02	
Pushmataha	94	50	74.2	5.23	
Riverton	94	42	69.6	3.58	
Scottsboro	94	42	71.4	3.77	
Selma	97	52	75.7	7.78	
Talladega	95	48	73.3	2.88	
Tallassee				6.85	
Thomasville	99	51	76.0	2.70	
Tuscaloosa	90[c]	48[c]	71.8[c]	5.99	
Tuscumbia	90	49	71.6	4.87	
Tuskegee	94	51	75.0	4.95	
Union Springs	93	52	75.5	5.10	
Uniontown	94	48	73.8	7.60	
Valleyhead	92	40	70.3	3.92	
Verbena				6.72	
Wetumpka	94	50	75.2	5.36	
Alaska.					
Killisnoo	72	38	53.6	0.75	
Sitka	77	36	52.8	0.90	
Skagway	82	33	57.6	0.56	
Arizona.					
Agua Caliente	114	51	85.8	0.00	
Allaire Ranch				0.33	
Arizona Canal Co's Dam	109	60	82.9	0.34	
Ashfork	99	33	66.6		
Aztec	114			0.00	
Benson	108	50	77.7	0.65	
Bisbee	98	51	73.8	0.60	
Buckeye	106	46	77.2	0.00	
Casagrande	117				
Cochise[o1]	108	61	76.7	0.00	
Congress	105	63	82.4	T.	
Dudleyville	110	53	78.8	0.34	
Duncan	104	42	70.8	1.08	
Fort Defiance	90	34	60.2	4.67	
Fort Huachuca	99	57	79.5	0.43	
Gilabend	110	59	84.0	0.00	
Greaterville	94	51	71.0	1.81	
Jerome	100	56	76.4	0.40	
Kingman	105	56	80.2	0.27	
Maricopa	113	61	86.0	0.10	
Mesa	114	61	84.4	0.24	
Mesa (near)	112	55	84.0	0.18	
Mohawk Summit[o1]	118	76	92.5	0.00	
Natural Bridge				1.27	
Nogales	103	47	75.2	0.64	
Oracle	97	55	77.8	0.31	
Oro				2.40	
Parker	120	61	88.0	0.00	
Phoenix	114	57	83.6	0.20	
Pinal Ranch				0.41	
Prescott	96	39	63.8	0.96	
San Carlos	111[c]			0.46	
San Simon	102	50	74.9	0.80	
Sentinel[o1]	113	78	93.2	0.00	
Signal	117	53	83.4	0.02	

Stations.	Temperature. (Fahrenheit.)			Precipitation.	
	Maximum.	Minimum.	Mean.	Rain and melted snow.	Total depth of snow.
Arizona—Cont'd.	°	°	°	*Ins.*	*Ins.*
Superstition				0.61	
Taylor	99	42	68.0	1.94	
Tombstone	100	52	76.4	0.60	
Tucson	108	57	80.4	0.22	
Upper San Pedro	102	45	73.0		
Vail[o5]	100	62	81.0	0.08	
Walnutgrove				0.06	
Wilcox	103	30	65.4	0.59	
Yarnell				0.18	
Arkansas.					
Alco	88	45	67.8	3.34	
Amity	90	49	69.8	2.78	
Arkadelphia	96	51	72.2	2.61	
Arkansas City				3.40	
Batesville	93	48	70.9	2.00	
Beebranch	93	48	69.9	1.60	
Blanchard	94	49	72.0	4.04	
Brinkley	93	48	70.3	1.60	
Camden *a*				3.21	
Camden *b*	97	52	74.2	2.32	
Conway	98	49	72.2	0.45	
Corning	88	53	68.8	1.98	
Dallas	93	48	70.7	1.25	
Dardanelle				0.60	
De Queen	99	51	74.8	2.86	
Dodd City	91	44	68.6	2.55	
Dutton		42		4.55	
Elon	94[d]	49[d]	71.8[d]	2.24	
Eureka Springs	90	45	67.8	4.79	
Fayetteville	89	42	65.9	3.06	
Forrest City	94	50	74.8	1.91	
Fulton				1.76	
Hardy	91	45	68.7	2.74	
Helena *a*				2.10	
Helena *b*	94	49	72.3	1.93	
Jonesboro	93	46	70.2	2.30	
Lacrosse	92	47	69.5	2.94	
Lake Village	95	51	72.6	2.00	
Lonoke	94	46	70.6	1.50	
Lutherville	90	42	68.4	1.69	
Malvern	96	47	71.8	3.35	
Marvell	94	49	72.0	2.26	
Mossville	84	45	64.8	4.93	
Mountain Home	92	45	70.5	1.52	
Mount Nebo	87	47	68.6	0.97	
New Gascony	95[d]	45[d]	68.6[d]	4.00	
Newport *a*				0.67	
Newport *b*	98	50	72.5	0.74	
Newport *c*	93	48	70.4	1.01	
Oregon	97	40	68.0	1.82	
Ozark	92	48	70.6	2.86	
Paragould	93	46	70.6	2.28	
Perry	94	48	71.2	1.00	
Pinebluff	95	49	72.0	5.50	
Pocahontas	95	43	69.6	3.52	
Pond	89	43	66.4	1.89	
Prescott	94	52	75.3	2.11	
Princeton	94	47[c]	72.6	2.91	
Rison	94	43	69.9	8.01	
Rosadale	96	51	72.9	2.22	
Russellville	96	37	71.9	1.39	
Silversprings	88	42	66.8	1.74	
Spielerville	96	48	71.6	1.72	
Stuttgart	92	47	70.2	2.90	
Texarkana	97	51	73.0		
Warren	99	47	73.6	3.13	
Washington	88	52	70.6	2.44	
Wiggs	92	44	68.4	1.30	
Winchester	96	48	71.5	3.18	
Winslow	86	43	65.5	5.78	
Witts Springs	87	40	66.0	7.08	
California.					
Angiola	108	43	75.7	0.00	
Azusa	96	47	70.0	0.00	
Bagdad	113	70	94.0	0.00	
Bakersfield	109	47	77.3	0.22	
Ballast Point L. H				0.00	
Barstow	110	43	77.2	T.	
Bear Valley				0.36	
Berkeley	101	42	62.9	T.	
Bishop	98	45	69.0	0.20	
Boca[o1]	87	24	52.2	T.	
Bodie	83	14	49.9	0.31	
Bowman	88	40	63.2	0.40	
Branscomb	100	33	61.2	0.24	
Caliente[o1]	102	64	86.0	0.02	
Campbell	102	38	63.0	0.00	
Campo				T.	
Cape Mendocino L. H				0.30	
Cedarville	94	37	63.8	1.78	
Chico	106	47	75.0	T.	
Cisco[o1]	79	42	64.3	0.00	
Claremont	103	40	66.0	0.00	
Cloverdale	110	44	73.0	0.22	
Colusa	103	49	74.4	T.	
Corning[o1]	106	50	77.3	T.	
Coronado	75	56	65.8	0.00	
Crescent City	80	35	57.7	0.19	

Stations.	Temperature. (Fahrenheit.)			Precipitation.	
	Maximum.	Minimum.	Mean.	Rain and melted snow.	Total depth of snow.
California—Cont'd.	°	°	°	*Ins.*	*Ins.*
Crescent City L. H				0.64	
Cuyamaca	82	39	59.7	0.00	
Delta[o5]	104	53	77.5	0.02	
Drytown	106	42	71.5	0.00	
Dunnigan[o5]	106	46	70.6	0.20	
Durham	107	45	74.7	0.00	
East Brother L. H				0.05	
Elcajon	89	46	68.4	T.	
Elmdale	108	42	73.4	T.	
Elsinore	102	48	73.6	0.00	
Escondido	101	38	72.0	0.00	
Fallbrook	90	46	69.0	0.05	
Folsom[o1]	108	57	76.5	0.01	
Fordyce Dam				0.92	
Fort Ross	82	42	58.0	0.09	
Foster				0.00	
Georgetown	97	40	69.2	0.03	
Gilroy (near)	103	37	66.0	0.00	
Greenville	97	29	66.2	0.64	
Hanford	107	40	79.0	0.00	
Healdsburg	111	38	70.0	T.	
Hollister	103	36	65.2	0.00	
Humboldt L. H				0.89	
Idylwild	92	38	61.6	0.09	
Imperial	121	66	93.6	T.	
Indio[o1]	117	72	91.1	0.00	
Iowa Hill[o1]	91	50	68.8	0.06	
Irvine	86	60	71.5	0.00	
Jackson	100	41	70.4	T.	
Jamestown	100	40	70.5	0.00	
Jolon				0.00	
Kennedy Gold Mine	96	32	65.9	0.00	
Kentfield	101	44	64.8	T.	
Laguna Valley				0.15	
Lakeport (near)	94	49	70.1	T.	
Laporte	82	32	58.8	0.25	T.
Legrande				0.00	
Lemoncove	109	46	78.7	0.10	
Lick Observatory	87	35	61.6	T.	
Lime Point L. H				0.00	
Livermore	108	43	68.2	0.00	
Lodi	104	46	71.4	0.00	
Los Gatos	103	42	66.2	T.	
Mammoth[o5]	116	62	87.8	0.00	
Mare Island L. H				0.00	
Marysville	109	49	74.5	T.	
Meadow Valley[o1]	89	37	59.9	0.47	
Merced	108	48	80.1	0.00	
Mercury	108	42	70.3	0.00	
Mills College				0.00	
Milo				0.00	
Milton (near)	102	45	72.7	T.	
Modesto[o1]	108	52	75.6	0.00	
Mohave	105	42	76.2	0.00	
Mokelumne Hill				0.02	
Montague	100	37	65.8	0.32	
Monterio	90	42	66.8	0.96	
Mount St. Helena				T.	
Napa	108	42	66.6	0.00	
Needles	112	73	91.5	0.00	
Nevada City	98	35	65.0	0.16	
Newcastle	105	44	73.2	0.00	
Newman	107	42	75.8	0.00	
Niles	98	46	64.3	0.00	
North Bloomfield	98	37	67.2	0.21	
North San Juan	98	39	69.7	0.15	
Oakland	98	47	64.1	T.	
Ogilby[o5]	118	75	95.6	0.00	
Ontario	99	47	71.0	0.00	
Orland	102	50	71.9	T.	
Orleans	109	42	71.7	0.57	
Oroville (near)	108	49	75.4	0.04	
Palermo	107	44	73.6	0.04	
Paso Robles	106	36	68.1	0.00	
Peachland[o5]	102	49	68.2	0.02	
Piedras Blancas L. H				0.00	
Pigeon Point L. H				0.00	
Pine Crest	88	49	64.0	T.	
Placerville	98	38	66.3	0.00	
Point Ano Nuevo L. H				0.00	
Point Arena L. H				0.02	
Point Bonita L. H				0.00	
Point Conception L. H				0.00	
Point Fermin L. H				0.00	
Point George L. H				0.09	
Point Hueneme L. H				0.00	
Point Lobos	87	48	56.8	T.	
Point Loma L. H				0.51	
Point Montara L. H				0.00	
Point Pinos L. H				0.00	
Point Sur L. H				0.00	
Porterville	107	45	76.0	0.01	
Poway				0.00	
Quincy	90	34	63.6	0.92	
Redding	102	51	76.1	0.02	
Redlands	99	42	70.9	0.00	
Reedley	107	53	80.6	0.00	
Represa	100	50	73.2	0.00	

TABLE II.—*Climatological record of voluntary and other cooperating observers*—Continued.

Stations.	Temperature. (Fahrenheit.)			Precipitation.	
	Maximum.	Minimum.	Mean.	Rain and melted snow.	Total depth of snow.
California—Cont'd.	°	°	°	*Ins.*	*Ins.*
Riovista	104	45	71.4	T.	
Riverside	96	46	68.8	0.00	
Roe Island L. H.				0.00	
Rohnerville				0.56	
Rosewood	105	42	75.2	0.03	
Sacramento	98	48	70.6	T.	
Salinas	97	40	61.3	0.00	
Salton	120	62	94.2	0.00	
San Bernardino	101	40	70.6	0.00	
San Jacinto	100	46	71.8	T.	
San Jose	100	40	65.6	0.00	
San Leandro	102	43	63.8	0.00	
San Luis L. H.				0.00	
San Mateo *1	100	58	69.5	0.00	
San Miguel *1	102	49	74.0	0.00	
Santa Barbara	85	47	63.4	0.02	
Santa Barbara L. H				0.00	
Santa Clara				0.00	
Santa Clara College	106	37	63.8	0.00	
Santa Cruz	100	36	61.9	0.00	
Santa Cruz L. H.				0.00	
Santa Maria	91	43	63.7	0.00	
Santa Monica	75	48	61.9	0.00	
Santa Paula	87	50	70.0	0.00	
Santa Rosa	107	37	65.8	0.03	
Shasta	106	45	77.4	T.	
Sierra Madre	89	50	67.2	0.19	
Sisson	99	35	65.8	0.33	
Sonoma				T.	
S. E. Farallone L. H				0.00	
Stockton	103	43	70.7	0.00	
Storey	107	42	74.0	0.00	
Summerdale	85	38	61.2	0.29	
Susanville	90	33	62.7	0.32	
Tehama *1	105	56	81.6	T.	
Tejon Ranch	100	49	75.2	T.	
Trinidad L. H				0.67	
Truckee *1	82	34	55.3	0.98	
Tulare c	108	48	76.6	0.00	
Tustin	84	64	73.0	0.00	
Ukiah	107	39	68.2	T.	
Upland	94	46	67.8	0.00	
Upperlake	101	38	67.5	T.	
Upper Mattole *1	94	41	56.8	0.88	
Vacaville *1	109	54	74.4	T.	
Ventura	81	48	64.2	0.00	
Visalia	107	46	75.6	0.05	
Volcano Springs	120	59	88.5	0.00	
Wasco	107	45	77.6	0.00	
Wheatland	104	48	72.7	T.	
Williams *1	106	58	83.0	0.00	
Willits	102	42	67.8	0.02	
Willow	104	48	75.8	T.	
Yerba Buena L. H.				0.00	
Zenia	98	35	60.6	0.79	
Colorado.					
Alford	89	31	56.6	3.20	
Antelope Springs	85	26	52.9	1.37	
Ashcroft	79	28	49.8	3.53	
Blaine	99	35	66.2	1.68	
Boulder	88	39	61.2	1.87	
Boxelder				4.04	
Breckenridge	78	22	47.8	2.06	2.2
Buenavista				0.30	
Canyon	95	37	62.1	3.66	
Castlerock	90	34	58.6	3.25	
Cedaredge	93	40	64.8	0.16	
Cheesman	92	32	57.8	3.14	
Cheyenne Wells	94	36	62.0	2.63	
Clearview	78	27	47.3	6.60	
Colorado Springs	92	37	57.8	5.10	
Collbran	91	41	62.7	1.93	
Durango	92	40	61.7	2.02	
Fort Collins	92	37	59.3	2.23	
Fort Morgan	92	36	62.1	2.85	
Fox	95	30	62.0	2.71	
Fruita	98	45	68.5	1.16	
Garnett	87	33 b	56.6 d	2.15	
Gilman				1.43	
Gleneyre	92	35	57.6	5.42	
Glenwood Springs	91	36	61.0	1.37	
Greeley	95	36	62.1	1.76	
Grover				1.71	
Gunnison	86	31	55.0	2.21	
Hamps	92	32	59.0	3.73	
Hoehne	95	32	59.8	4.28	
Holly	99	40	66.1	6.51	
Husted	92	35	56.2	4.07	
Lake Moraine	74	25	44.6	6.10	
Lamar	101	39	66.3	4.35	
Laporte				3.03	
Las Animas	99	34	64.4	2.87	
Lay	90	23	56.7	0.23	
Leadville (near)				1.62	6.0
Leroy	92	34	61.2	1.07	
Longs Peak	76	19	47.6	3.27	
Mancos	87	38	58.8	1.51	
Meeker	90	32	58.7	0.68	

Stations.	Temperature. (Fahrenheit.)			Precipitation.	
	Maximum.	Minimum.	Mean.	Rain and melted snow.	Total depth of snow.
Colorado—Cont'd.	°	°	°	*Ins.*	*Ins.*
Moraine	81	29	51.4	3.25	
Pagoda		30		0.68	
Parachute	99	41	66.6	1.20	
Platte Canon				2.77	
Rangely	93	39	64.5	0.50	
Rockyford	97	39	65.2	3.94	
Rogers Mesa	96	35	65.7	0.58	
Russell	83	28	50.9	4.81	
Saguache	88	38	58.2	2.68	
Salida	90	35	57.4	2.47	
San Luis	88	30	55.0	1.92	
Santa Clara	88	29	54.8	9.25	1.0
Silt	91	43	64.4	0.83	
Sugarloaf	80	32	52.0	3.48	T.
Trinidad	90	35	60.6	5.48	
Twinlakes				1.94	
Vilas				2.35	
Wallet				2.34	
Waterdale	88	35	59.2	2.91	
Westcliffe	82	27	52.6	7.01	
Whitepine	76	28	47.0	3.08	T.
Wray	95	37	64.0	1.55	
Yuma				2.10	T.
Connecticut.					
Bridgeport	88	44	62.1	8.48	
Canton	82	35	58.1	11.69	
Colchester	82	40	59.2	8.40	
Falls Village				10.01	
Hartford	84	44	60.8	11.03	
Hawleyville	82	38	62.0	10.38	
Lake Konomoc				5.65	
New London	84	47	60.3	4.44	
North Grosvenor Dale	85	38	60.0	7.33	
Norwalk	83	40	62.5	10.54	
Southington	84	38	60.6	12.10	
South Manchester				9.05	
Storrs	82	43	59.0	9.24	
Voluntown	84	35	59.8	6.88	
Wallingford				11.48	
Waterbury	87	37	61.1	11.25	
West Cornwall	83	41	62.0	9.74	
West Simsbury				9.79	
Delaware.					
Delaware City				2.66	
Milford	90	46	67.9	4.93	
Millsboro	91	46	66.5	2.97	
Newark	85	48	65.1	3.23	
Seaford	88	50	66.6	3.46	
District of Columbia.					
Distributing Reservoir *b	84	54	67.7	4.04	
Receiving Reservoir *b	80	54	68.2	5.11	
West Washington	88	47	67.6	4.29	
Florida.					
Archer	93	60	77.9	8.25	
Avon Park	95	65	80.5	5.63	
Bartow	92	68	80.4	10.38	
Bonifay	93	60	77.2	10.20	
Carrabelle	92	59	77.6	8.27	
Clermont	97	66	80.8	8.15	
De Funiak Springs	94	55	75.8	9.55	
Deland	95	61	79.4		
Eustis	97	67	80.8	7.60	
Federal Point	95	63	78.5	6.04	
Fernandina	90	61	77.4	4.61	
Flamingo	93	66	81.0	7.98	
Fort George *1	90	66	79.2		
Fort Meade	99	63	80.3	4.03	
Fort Myers	92	65	79.0	10 45	
Fort Pierce	94	64	78.2	4.93	
Gainesville	93	61	78.2	5.74	
Grasmere	97	66	81.4		
Huntington	98	62	79.8	6.98	
Hypoluxo	92	65	78.0	9.51	
Inverness	95	63	79.2	3.86	
Jasper	88	60	77.0	6.51	
Kissimmee	91	63	77.9	10.12	
Lake City	93	58	77.7	7.12	
Macclenny	96	56	78.4	5.57	
Madison	95	56	78.4	4.72	
Malabar	97	62	80.0	1.64	
Manatee	92	64	79.0	4.77	
Marco	95	70	81.6	5.57	
Marianna	92	57	76.8	5.96	
Merritt Island	92	70	79.8	3.73	
Miami	94	67	80.2	10.48	
Middleburg	98	55	77.5	5.64	
Molino	95	54	76.2	5.50	
New Smyrna	91	63	76.2	7.64	
Ocala	98	62	79.0	8.02	
Orange City		60		7.85	
Orlando				11.05	
Pinemount	94	57	77.8	8.00	
Quincy	98	55	77.2	6.27	
Rockwell	99	62	81.6	14.54	
St. Andrews	92	58	78.8	5.13	
St. Augustine	92	60	77.4	3.40	
St. Leo	95	62	78.2	5.30	
Stephensville	92	54	77.4	2.31	

Stations.	Temperature. (Fahrenheit.)			Precipitation.	
	Maximum.	Minimum.	Mean.	Rain and melted snow.	Total depth of snow.
Florida—Cont'd.	°	°	°	*Ins.*	*Ins.*
Sumner	91	60	77.0	3.59	
Switzerland	92	61	77.8	4.51	
Tallahassee	89	59	76.1	10.01	
Tarpon Springs	93	64	78.7	5.45	
Titusville	95	63	78.1	9.89	
Waukeenah	95	57	78.2	9.25	
Wausau	98	56	78.4	8.10	
Wewahitchka	94	60	77.3	4.45	
Georgia.					
Abbeville				6.18	
Adairsville	90	46	72.0	4.84	
Albany	96	58	77.6	2.62	
Allapaha	96	57	77.4	7.59	
Alpharetta	89	43	70.0	8.51	
Americus	96	53	77.4	6.15	
Athens	90	48	72.6	4.12	
Bainbridge	94	57	77.3	3.61	
Blakely	92			7.17	
Bowersville	92	45	72.2	3.63	
Butler				5.12	
Camak	93	47	74.5	4.02	
Carlton				7.99	
Clayton	87	45	67.4	11.14	
Columbus	101	54	76.8	5.03	
Coney	98	54	77.6	5.46	
Covington	91	47	72.6	4.32	
Dahlonega	86	44	68.0	10.05	
Dawson	96	53	76.7	3.70	
Diamond	92	41	69.3	11.57	
Douglas	98	55	78.1	4.62	
Dublin				5.51	
Dudley	94	51	76.4	3.39	
Eastman	99	53	78.2	5.56	
Eatonton	92	54	73.4	5.76	
Elberton	92	47	73.0	7.65	
Experiment	92	47	72.9	2.27	
Fitzgerald	96	53	77.2	8.59	
Fleming	96			8.36	
Forsyth	93	47	74.2	5.15	
Fort Gaines	96	55	78.2	3.72	
Gainesville	89	45	70.4	6.03	
Gillsville	91	44	71.1	6.44	
Greensboro	93	47	73.8	5.26	
Greenbush	91	48	72.6	4.81	
Griffin	91	46	72.4	3.96	
Harrison	92	52	75.2	10.20	
Hawkinsville	96	51	76.6	6.72	
Hephzibah	94			3.19	
Jesup	99	55	78.0	6.42	
Lost Mountain	89	45	71.5	4.72	
Louisville	91	52	75.6	3.20	
Lumpkin	97	51	76.4	3.93	
Marshallville	93 b	52 b	76.2 b	9.56	
Mauzy b	94	55	76.6	8.43	
Milledgeville	92	50	74.1	5.25	
Millen	96	50	77.2	5.31	
Monticello	96	48	74.8	5.57	
Morgan	91	52	74.4	3.78	
Naylor	96	55	78.6	6.46	
Newnan	94	47	73.0	5.09	
Oakdale				8.69	
Oakfield				5.20	
Point Peter	94	45	72.8	11.16	
Poulan	94	53	75.8	7.98	
Putnam	97	51	76.0	5.01	
Quitman	96	54	78.8	7.82	
Ramsey	87	42	69.2	5.45	
Resaca				4.83	
Rome	93	44	72.2	5.12	
St. Marys	95	59	78.4	7.29	
Statesboro	95	52	77.0	9.31	
Stillmore	95	50	75.3	5.10	
Talbotton	93	49	73.2	5.80	
Tallapoosa	89	46	69.8	4.43	
Thomasville	95	55	77.6	5.05	
Toccoa	90	45	71.0	7.67	
Valona	94	57	76.9	5.72	
Vidalia	93	54	77.2	6.92	
Washington	91	49	73.4	6.59	
Waverly	95	58	78.0	7.95	
Waycross	97	58	79.0	5.44	
Waynesboro	88	52	74.4	9.27	
Westpoint	99	59	75.8	4.76	
Idaho.					
Albion	89	37	63.6	0.32	
American Falls	90	37	64.6	0.59	
Blackfoot	90	38	66.0	0.06	
Blue Lakes	94	48	70.4	0.68	
Burnside	83	30	59.6	2.47	
Cambridge	96	40	68.6	0.51	
Chesterfield	85	31	58.8	0.77	
Dickey	82	36	60.5		
Forney	88	28	59.0	0.71	
Garnet	99	53	76.0	0.79	
Grangeville	86	42	62.6	3.86	
Idaho City	90	36	63.6	0.46	
Lake	76	30	52.8	1.20	
Lakeview	90	40	64.1	3.32	

TABLE II.—*Climatological record of voluntary and other cooperating observers*—Continued.

Stations.	Temperature. (Fahrenheit.)			Precipitation.	
	Maximum.	Minimum.	Mean.	Rain and melted snow.	Total depth of snow.
Idaho—Cont'd.	°	°	°	*Ins.*	*Ins.*
Lost River	84	34	59.6	0.77	
Meadows	90	31	60.6	2.64	
Moscow	88	40	61.0	1.80	
Murray	92	37	61.9	2.70	
Oakley	96	37	65.6	0.70	
Ola	92	43	68.2	0.47	
Pollock	97	43	68.4	3.06	
Porthill	83	39	62.6	1.45	
Priest River	90[f]	36[f]	62.1[f]	3.17	
Riddle	88	34	60.8	0.98	
Roosevelt	75[h]	27[h]	54.0[h]	0.36	
St. Maries	92	43	65.4	3.47	
Silver City	88	33	62.1	1.28	
Soldier	87	33	60.4	0.95	
Vernon	83	32	59.6	0.77	
Weston	92	37	64.2	0.58	
Illinois.					
Albion	91	40	69.4	3.05	
Aledo	92	38	66.0	3.84	
Alexander	88	41	66.6	5.20	
Antioch	88	36	62.6	2.90	
Ashton	87	35	62.8	1.69	
Astoria	90	39	65.2	3.50	
Aurora	89	38	63.4	4.09	
Beardstown	.....	.....	.....	2.29	
Benton	90	43	70.0	2.47	
Bloomington	94	37	67.2	3.25	
Bushnell	93	39	67.4	1.43	
Cambridge	90	41	65.5	2.85	
Carlinville	89	42	67.2	3.75	
Centralia	90	40	67.9	2.34	
Charleston	90	40	67.6	5.55	
Chester	.....	.....	.....	2.69	
Chicago Heights	.....	.....	.....	1.91	
Cisne	90	40	68.8	2.07	
Coatsburg	92	39	66.8	4.50	
Cobden	89	42	68.7	2.25	
Danville	92	39	66.2	2.65	
Decatur	90	38	66.2	2.61	
Dixon	93	39	64.8	1.46	
Dwight	94	38	65.8	2.37	
Effingham	87	48	67.9	4.57	
Equality	90	42	68.8	2.40	
Fandon	93	38	65.9	1.57	
Flora	89	40	67.2	2.18	
Friendgrove	86	42	67.8	2.33	
Galva	90	38	64.2	3.64	
Grafton	.....	.....	.....	3.40	
Greenville	92	41	68.3	2.41	
Griggsville	93	45	69.4	3.14	
Halfway	89	43	69.7	2.78	
Halliday	90	40	69.4	1.91	
Havana	94	.....	.....	2.55	
Henry	92	38	65.0	2.67	
Hillsboro	89	42	66.8	4.26	
Hoopeston	94	36	65.4	1.84	
Joliet	90	40	64.4	1.68	
Kishwaukee	90	36	62.4	2.38	
Knoxville	93	36	64.0	2.43	
Lagrange[e]	86	38	62.0	2.06	
Laharpe	93	37	66.0	2.20	
Lanark	90	31	61.8	1.88	
Loami	.....	.....	.....	3.96	
McLeansboro	90	44	69.2	4.09	
Martinton	90	38	64.6	3.33	
Mascoutah	87	44	67.0	3.92	
Mattoon	84	36	65.0	3.12	
Minonk	91	37	64.6	4.12	
Monmouth	93	33	64.6	2.27	
Morrison	89	37	63.5	2.02	
Morrisonville	89	41	66.6	3.15	
Mount Carmel	.....	.....	.....	6.22	
Mount Pulaski	89	39	66.8	1.98	
Mount Vernon	90	43	69.6	4.89	
New Burnside	91	44	70.2	3.13	
Olney	91	43	69.4	3.57	
Ottawa	89	42	67.2	3.78	
Palestine	92	38	69.4	2.51	
Pana	90	35	63.6	3.25	
Paris	88[h]	39[h]	67.2[h]	1.10[h]	
Peoria *a*	.....	.....	.....	2.13	
Peoria *b*	95	44	70.0	2.39	
Philo	89	37	65.1	3.36	
Plumhill	90	42	66.8	1.94	
Pontiac	91	40	66.0	1.39	
Rantoul	90	38	65.3	6.13	
Raum	90	43	69.3	1.60	
Riley	89	37	62.6	1.65	
Robinson	89	39	66.5	3.01	
Rockford	89	43	64.4	1.62	
Rushville	91	39	66.8	2.26	
St. Charles	90	38	63.6	3.08	
St. John	91	42	70.2	1.37	
Shobonier	90	39	68.4	2.60	
Streator	89	40	64.6	2.07	
Sullivan	89	37	66.0	4.99	
Sycamore	88	38	63.6	2.70	
Tilden	89	42	68.0	2.51	

Stations.	Temperature. (Fahrenheit.)			Precipitation.	
	Maximum.	Minimum.	Mean.	Rain and melted snow.	Total depth of snow.
Illinois—Cont'd.	°	°	°	*Ins.*	*Ins.*
Tiskilwa	90	40	63.9	2.82	
Tuscola	89	38	65.8	2.60	
Urbana	90	40	65.5	2.56	
Walnut	91	39	65.8	1.96	
Winchester	91	44	67.4	3.04	
Winnebago	88	36	63.2	2.75	
Yorkville	90	37	63.7	4.72	
Zion	89	37	64.0	1.55	
Indiana.					
Anderson	89	41	65.6	4.49	
Angola	86	42	63.0	3.35	
Auburn	87	42	62.6	4.10	
Bloomington	88	42	67.2	2.55	
Bluffton[d]	83	41	62.4	.....	
Butlerville	86	38	66.1	9.49	
Cambridge City	88	41	63.8	5.44	
Columbus	87	39	66.3	4.30	
Connersville	89	40	64.8	4.20	
Crawfordsville	93	40	67.7	3.67	
Delphi	92	38	65.6	5.20	
Edwardsville[*1]	85	44	69.9	2.64	
Elkhart	92	44	64.8	1.36	
Farmland	88	41	64.0	3.63	
Fort Wayne	88	43	64.0	2.52	
Franklin[*1]	88	50	67.6	3.02	
Greencastle	88	39	66.0	3.65	
Greensburg	89	36	66.2	5.19	
Hammond	92	40	62.3	2.75	
Hector	91	40	64.8	3.00	
Holland	90	39	68.3	2.78	
Huntington	90	42	65.2	3.37	
Jeffersonville	89	44	69.8	4.15	
Kokomo	90	40	65.6	2.47	
Lafayette	89	37	65.8	2.37	
Laporte	94	41	63.4	2.06	
Logansport	93	41	66.0	3.65	
Madison *a*	92	41	69.2	8.82	
Madison *b*	.....	.....	.....	7.31	
Marengo	90	37	69.3	2.38	
Marion	92	39	65.0	6.60	
Markle	88	41	63.8	2.50	
Mauzy	89	39	65.1	3.52	
Moores Hill	88	40	66.2	4.16	
Mount Vernon	92	41	66.8	4.02	
Northfield	88	38	63.8	2.42	
Paoli	89	38	67.4	3.26	
Prairie Creek	87	38	65.4	3.59	
Princeton	89	39	68.0	2.82	
Rensselaer	.....	.....	.....	2.34	
Richmond	87	39	65.0	3.72	
Rockville	87	39	65.4	3.98	
Rome	91	37	69.2	5.71	
Salem	91	30	68.5	4.12	
Scottsburg	89	42	69.0	8.11	
Seymour	87	40	67.6	4.55	
Shelbyville	88	38	67.6	2.66	
South Bend	89	39	63.8	5.52	
Syracuse	92	39	64.6	3.24	
Terre Haute	90	43	68.6	2.24	
Topeka	88	41	62.5	3.31	
Valparaiso	92	41	63.5	1.32	
Veedersburg	89[f]	36[f]	65.2[f]	3.71	
Vevay	87	44	67.7	3.80	
Vincennes	92	40	69.2	2.28	
Washington	91	38	68.4	3.11	
Winamac [e]	96	38	64.2	4.24	
Indian Territory.					
Ardmore	96	45	72.4	2.29	
Chickasha	99	46	71.8	1.39	
Durant	102	50	74.2	5.88	
Fairland	89	46	68.8	3.98	
Goodwater	94	50	71.2	4.44	
Hartshorne	91	48	70.6	1.90	
Healdton	95	44	71.1	1.80	
Holdenville	91	47	70.1	0.48	
Hugo	.....	.....	.....	3.48	
Marlow	95	43	70.4	1.81	
Muskogee	95	48	70.2	1.11	
Pauls Valley	94	46	70.6	3.05	
Ravia	95	49	72.3	1.63	
Roff	94	47	70.6	2.19	
South McAlester	.....	.....	.....	2.33	
Tulsa	.....	.....	.....	0.82	
Wagoner	94	46	69.8	.....	
Webbers Falls	93	46	70.0	1.11	
Iowa.					
Afton	94	38	66.1	2.97	
Albia	89	38	64.4	3.93	
Algona	91	41	65.4	4.26	
Allerton	90	36	64.8	3.90	
Alta	87	38	63.3	4.85	
Amana	93	36	64.9	1.33	
Ames	90	37	64.8	1.97	
Atlantic	93	36	64.4	3.34	
Audubon	90	38	64.6	3.33	
Baxter	89	36	64.4	1.42	
Bedford	90	38	64.6	1.50	
Bonaparte	93	38	65.8	2.30	

Stations.	Temperature. (Fahrenheit.)			Precipitation.	
	Maximum.	Minimum.	Mean.	Rain and melted snow.	Total depth of snow.
Iowa—Cont'd.	°	°	°	*Ins.*	*Ins.*
Britt	90	36	64.9	2.58	
Buckingham	.....	.....	.....	2.40	
Burlington	91	40	66.2	1.75	
Carroll	90	36	64.0	4.99	
Cedar Rapids	96	41	65.4	1.14	
Chariton	90	37	64.0	3.61	
Charles City	86	34	62.6	1.93	
Chester	85	32	61.8	2.28	
Clarinda	93	41	66.3	3.29	
Clearlake	95	37	67.4	1.60	
Clinton	94	37	65.6	1.66	
College Springs	91	42	67.0	1.44	
Columbus Junction	91	40	65.7	2.69	
Corning	89	40	64.2	3.38	
Corydon	88	37	64.4	4.31	
Council Bluffs	91	42	66.4	1.83	
Cumberland	.....	.....	.....	2.96	
Danville	.....	.....	.....	3.64	
Decorah	83	39	63.2	1.57	
Delaware	87	38	63.2	2.12	
Denison	86	30	61.4	3.17	
Desoto	89	42	64.9	3.82	
Dows	88	37	63.4	3.07	
Earlham	88	34	62.6	4.20	
Elkader	90	34	64.0	1.50	
Estherville	86	38	62.9	3.36	
Fayette	88[c]	30[c]	61.8[c]	1.91	
Forest City	85	38	63.6	1.70	
Fort Dodge	87	37	61.8	.....	
Fort Madison	.....	.....	.....	3.49	
Galva	89[b]	34[d]	63.6[d]	4.07	
Gilman	.....	.....	.....	2.56	
Grand Meadow	87	38	63.8	1.90	
Greene	90	36	64.4	2.56	
Greenfield	89	40	64.1	4.83	
Grinnell	92	37	65.3	1.90	
Grundy Center	88	38	63.6	3.14	
Guthrie Center	91	38	65.6	3.62	
Hampton	88	39	65.0	2.49	
Hanlontown	88	35	61.0	1.23	
Harlan	91	37	65.0	2.83	
Hopeville	93	39	64.3	3.06	
Humboldt	89	40	64.8	6.04	
Idagrove	91	38	65.6	3.45	
Independence	87	35	62.8	3.32	
Indianola	90[c]	41[c]	65.2[c]	4.51	
Iowa City	89	39	64.8	1.95	
Iowa Falls	86	34	62.2	2.15	
Jefferson	.....	.....	.....	4.58	
Keosauqua	89	36	62.8	2.41	
Lacona	.....	.....	.....	4.60	
Lansing	87	35	64.9	2.08	
Larchwood	91	35	64.6	3.34	
Larrabee	93	34	65.4	3.02	
Leclaire	.....	.....	.....	3.04	
Lemars	92	36	64.8	3.80	
Lenox	89	40	64.5	2.65	
Leon	91	39	65.3	2.64	
Logan	93	38	65.4	3.73	
Maple Valley	.....	.....	.....	5.25	
Maquoketa	87	33	62.7	2.10	
Marshalltown	90	36	64.1	2.74	
Mason City	87	42	65.6	1.42	
Monticello	89	36	65.6	4.03	
Mountayr	85	38	64.6	3.38	
Mount Pleasant	94	40	66.3	1.05	
Mount Vernon	91	38	66.1	1.17	
New Hampton	.....	37	.....	2.09	
Newton	90	38	63.6	1.87	
Northwood	81	38	63.4	3.24	
Odebolt	94	37	65.2	2.70	
Ogden	88	36	59.4	5.42	
Olin	90	35	63.8	1.42	
Onawa	93	43	67.2	3.85	
Osage	85	38	63.1	2.10	
Osceola	88	37	64.2	4.13	
Oskaloosa	91	38	64.7	1.73	
Ottumwa	91	45	66.6	2.37	
Pacific Junction	93	41	66.6	1.70	
Perry	87	40	65.2	3.09	
Plover	90	38	64.8	3.50	
Primghar	89	37	63.9	3.22	
Redoak	91	46	66.3	3.25	
Ridgeway	89	41	66.3	1.22	
Rockwell City	90	41	65.8	5.93	
Sac City	91	39	65.0	4.20	
St. Charles	91	41	65.2	5.21	
Scranton	94	.....	.....	4.24	
Sheldon	86	37	63.4	2.32	
Sibley	87	36	63.4	3.82	
Sigourney	96	35	66.2	1.72	
Sioux Center	89	38	64.0	2.99	
Spirit lake	88	42	64.2	3.27	
Stockport	.....	.....	.....	1.42	
Storm Lake	87	38	63.8	4.85	
Stuart	90	40	64.4	4.09	
Thurman	94	41	66.2	1.62	
Tipton	92	40	67.8	0.98	

TABLE II.—*Climatological record of voluntary and other cooperating observers*—Continued.

Stations.	Temperature. (Fahrenheit.)			Precipitation.	
	Maximum.	Minimum.	Mean.	Rain and melted snow.	Total depth of snow.
Iowa—Cont'd.	°	°	°	*Ins.*	*Ins.*
Toledo	89	34	64.0	2.07	
Villisca	91	42	67.0	3.82	
Vinton [*1]	83	46	64.8	1.91	
Wapello	89	42	64.8	2.99	
Washington	92	35	63.8	1.70	
Washta	.....	.....	.....	4.72	
Waterloo	85	37	63.2	1.93	
Waukee	.....	.....	.....	3.11	
Waverly	87	37	63.6	1.86	
Westbend	88	39	65.7	3.03	
Westbranch	.....	.....	.....	1.57	
West Union	.....	.....	.....	0.75	
Whitten	90	35	65.0	3.45	
Wilton Junction	94	36	66.0	2.04	
Winterset	92	39	65.4	4.23	
Woodburn	.....	.....	.....	3.77	
Kansas.					
Achilles	98	33	62.6	0.96	
Alton	99	41	67.3	2.00	
Anthony	.....	.....	.....	0.38	
Atchison *b*	92	47	67.5	1.78	
Baker	91	43	66.1	3.11	
Beloit	98	44	67.7	2.63	
Burlington	93	42	67.8	3.26	
Chanute	92	45	69.4	4.16	
Clay Center	97	41	67.6	2.44	
Colby	97	35	64.2	2.19	
Columbus	91	46	68.8	1.90	
Cottonwood	93	40	67.0	1.92	
Dresden	99	43	64.2	1.42	
Ellinwood	96	41	67.4	3.97	
Emporia	95	45	67.2	1.05	
Englewood	98	40	69.2	1.66	
Eureka	.....	.....	.....	0.57	
Eureka Ranch	96	40	65.0	3.00	
Fall River	91	43	68.5	2.92	
Farnsworth	95	38	64.2	1.99	
Forsha	99	44	68.6	0.93	
Fort Leavenworth	93	46	69.1	3.95	
Fort Scott	92	45	68.0	4.64	
Frankfort	98	41	67.4	3.64	
Garden City	102	37	66.5	2.83	
Gove [*1]	98	40	66.9	1.21	
Grenola	92	43	67.1	0.82	
Hanover	98	43	68.8	2.55	
Harrison	96	39	65.5	1.65	
Hays	95	39	65.1	4.46	
Holton	.....	42	.....	2.73	
Horton	96	45	67.4	2.26	
Hoxie	98	39	65.2	2.55	
Hutchinson	97	39	66.0	1.48	
Independence	97	47	71.2	1.52	
Jetmore	99	40	64.8	1.08	
La Crosse	96	39	64.7	2.63	
Lakin	96	38	65.2	3.99	
Lebanon	96	40	65.6	1.60	
Lebo	94	47	68.4	3.46	
Leoti	96	32	63.3	3.46	
Macksville	96	40	64.2	1.20	
McPherson	99	44	67.7	1.20	
Madison	94	41	67.0	1.53	
Manhattan *b*	101	42	69.6	1.61	
Manhattan *c*	99	42	67.8	2.34	
Marion	97[f]	45[f]	68.7[f]	1.75	
Meade	101[d]	41[d]	68.4[d]	2.58	
Medicine Lodge	102	39	68.0	0.63	
Minneapolis	96	43	67.5	2.29	
Moran	90	46	68.3	3.10	
Mounthope [*1]	94	47	69.7	0.45	
Ness City	103	42	68.6	1.66	
Norwich	96	42	68.1	0.60	
Oberlin	.....	.....	.....	1.46	
Olathe	90	46	66.8	2.94	
Osborne	.....	.....	.....	3.79	
Oswego	90	45	68.8	2.24	
Ottawa	92	42	66.5	3.05	
Phillipsburg	.....	.....	.....	3.10	
Pittsburg	89	55	71.1	2.35	
Pleasanton	92	46	68.4	2.49	
Pratt	99	38	67.2	0.58	
Republic	95	40	66.3	2.54	
Rome	93	43	68.4	3.43	
Salina	100	42	67.8	1.48	
Sedan	94	45	69.0	1.55	
Toronto	93	40	67.6	1.30	
Ulysses	100[e]	42[e]	66.4[e]	7.10	
Valley Falls	93	44	66.2	4.82	
Viroqua	100	35	64.6	2.46	
Wakeeney	.....	.....	.....	3.98	
Wallace	99	33	63.6	2.34	
Walnut	90	47	69.4	3.14	
Wamego [*1]	96	49	67.6	4.22	
Winfield	95	44	68.2	1.29	
Yates Center	93	42	67.0	2.03	
Kentucky.					
Alpha	83	44	66.7	4.69	
Anchorage	90	38	67.8	4.48	
Bardstown	90	40	69.8	3.81	

Stations.	Temperature. (Fahrenheit.)			Precipitation.	
	Maximum.	Minimum.	Mean.	Rain and melted snow.	Total depth of snow.
Kentucky—Cont'd.	°	°	°	*Ins.*	*Ins.*
Beattyville	.....	.....	.....	5.19	
Beaver Dam	89	40	68.3	3.93	
Berea	89	42[e]	68.2[e]	2.97	
Blandville	89	47	69.0	1.72	
Bowling Green	91	39	68.9	5.95	
Burnside	87	41	68.5	3.59	
Cadiz	92	42	69.8	1.92	
Calhoun	90	41	69.1	4.78	
Catlettsburg	89	45	68.4	4.00	
Earlington	89	40	69.6	2.55	
Edmonton	88	38	67.6	4.28	
Eubank	88	38	66.2	3.67	
Falmouth	.....	.....	.....	2.78	
Fords Ferry	90	37	68.0	1.26	
Frankfort	86	43[1]	68.3[e]	3.99	
Franklin	89	51	69.4	5.45	
Greensburg	89	38	68.1	3.84	
Highbridge	90	42	69.2	1.59	
Hopkinsville	90	41	68.6	3.39	
Irvington	90	41	70.8	3.50	
Jackson	88	44	67.8	2.23	
Leitchfield	88	42	67.6	5.43	
Loretto	87	41	67.7	4.05	
Manchester	92	43	68.8	6.30	
Marrowbone	92	38	69.3	5.22	
Mayfield	88	43	68.4	0.70	
Maysville	93	42	68.8	3.27	
Middlesboro	85	44	67.9	1.85	
Mount Sterling	89	43	68.3	5.66	
Owensboro	87	43	68.8	3.35	
Owenton	92	44	69.0	3.75	
Paducah *a*	.....	.....	.....	0.47	
Paducah *b*	96	48	71.9	0.83	
Richmond	93	43	70.3	2.90	
St. John	86	41	68.3	3.94	
Scott	87	42	66.8	3.17	
Shelby City	88	42	67.8	1.87	
Shelbyville	89	42	69.8	4.63	
Taylorsville	90	41	68.6	4.97	
Williamsburg	88	42	68.7	4.15	
Williamstown	88	41	66.0	3.64	
Louisiana.					
Abbeville	96	55	77.0	4.22	
Alexandria	99	50	75.0	5.40	
Amite	98	53	76.5	2.98	
Baton Rouge	94	54	75.6	4.19	
Burnside	94	50	76.2	5.86	
Calhoun	94	53	72.7	3.04	
Cameron	90	56	75.2	2.43	
Caspiana	.....	.....	.....	1.50	
Cheneyville	98	50	74.8	3.49	
Clinton	91	52	74.4	4.48	
Collinston	96	52	74.2	1.15	
Covington	97	53	77.4	7.48	
Donaldsonville	93	55	76.3	2.97	
Emilie	93	57	76.3	5.16	
Farmerville	.....	.....	.....	1.65	
Franklin	96	55	77.6	4.79	
Grand Coteau	95	53	76.1	7.29	
Hammond	95	52	76.6	8.51	
Houma	96	54	76.9	4.28	
Jennings	.....	.....	.....	4.62	
Lafayette	95	54	76.1	2.79	
Lake Charles	94	55	75.8	9.14	
Lake Providence	93	53	73.4	3.23	
Lakeside	94	56	76.6	2.87	
Lawrence	94	58	77.4	8.22	
Leesville	98	49	73.3	4.85	
Libertyhill	99	52	74.2	2.61	
Mansfield	95	47	71.8	3.23	
Melville	93	51	77.2	4.85	
Minden	100	54	75.4	1.82	
Monroe	95[d]	56	74.8	1.58	
New Iberia	91	57	76.3	5.70	
Opelousas	95	53	75.2	7.77	
Oxford	98	50	73.6	3.33	
Paincourtville	93	56	76.0	3.79	
Plain Dealing	97	52	72.8	2.01	
Port Eads	89	64	77.6	3.91	
Rayne	101	53	78.0	1.37	
Reserve	100	54	78.2	4.28	
Robeline	96	48	72.2	4.45	
Ruston	97	50	73.4	0.99	
St. Francisville	98	52	75.4	5.80	
Schriever	98	52	75.4	4.34	
Sugar Experiment Station	95	58	78.0	3.56	
Sugartown	.....	.....	.....	5.25	
Venice	90	60	75.8	6.52	
Wallace	95	55	77.0	5.81	
Maine.					
Bar Harbor	82	36	56.2	3.23	
Belfast	83	37	57.6	3.51	
Bemis	81	39	59.0	14.60	
Cornish	84	42	59.4	8.83	
Danforth	.....	.....	.....	3.72	
Fairfield	80	37	60.0	3.56	
Farmington	82	34	59.6	5.70	
Fort Fairfield	82	25	59.2	1.93	

Stations.	Temperature. (Fahrenheit.)			Precipitation.	
	Maximum.	Minimum.	Mean.	Rain and melted snow.	Total depth of snow.
Maine—Cont'd.	°	°	°	*Ins.*	*Ins.*
Gardiner	82	37	61.0	5.12	
Houlton	82	33	60.5	2.45	
Kineo	84	36	59.6	2.79	
Lewiston	81	42	60.4	5.30	
Mayfield	83	40	58.5	6.54	
Millinocket	80	32	59.6	2.07	
North Bridgton	87	40	60.0	6.38	
Orono	81	32	59.8	2.09	
Patten	80	21	56.6	2.29	
Rumford Falls	84	38	60.2	5.25	
South Lagrange [*1]	87	43	61.7	.....	
The Forks	.....	.....	.....	4.36	
Vanburen	80	26	58.5	2.03	
Vanceboro	80	40	63.7	3.40	
Winslow	81	30	60.5	4.47	
Maryland.					
Annapolis	88	.....	.....	4.95	
Bachmans Valley	83	47	64.3	13.87	
Boettcherville	96	41	67.4	7.49	
Boonsboro	87	45	65.8	5.48	
Cambridge	91	47	68.2	4.36	
Chase	86	.....	.....	3.28	
Cheltenham	90	46	68.1	2.95	
Chestertown	87	48	66.8	3.12	
Chewsville	87	41	64.6	6.70	
Clearspring	86	44	64.0	5.81	
Coleman	87	49	67.4	3.09	
Collegepark	92	43	66.0	5.27	
Colora	.....	.....	.....	5.34	
Cumberland	.....	.....	.....	6.07	
Darlington	86[e]	47[e]	65.6[e]	5.63	
Deerpark	80[d]	35[d]	58.0[d]	6.55	
Denton	87	43	67.2	2.10	
Easton	87	45	67.8	8.13	
Fallston	84	48	65.4	5.37	
Frederick	89	47	67.5	7.27	
Grantsville	81	36	59.2	6.43	
Greatfalls	88	49	67.6	4.86	
Greenspring Furnace	90	47	67.0	7.06	
Hancock	92	43	67.0	8.19	
Harney	.....	.....	.....	7.63	
Jewell	85	51	67.0	5.91	
Johns Hopkins Hospital	88	.....	.....	5.22	
Laurel	87	45	66.7	6.41	
McDonogh	87	47	66.2	6.36	
Mount St. Marys College	85	49	65.3	8.17	
New Market	85	48	65.9	12.08	
Pocomoke City	86	51	68.8	4.23	
Prince Fredericktown	88	44	68.2	4.26	
Princess Anne	84	43	66.4	3.11	
Sharpsburg	86	48	65.6	5.97	
Solomons	84	52	68.4	3.12	
Sudlersville	90[d]	45[d]	67.0[d]	4.39	
Takoma Park	86	48	66.0	6.35	
Van Bibber	83	49	66.2	4.97	
Westernport	89	41	63.0	6.95	
Woodstock	88	46	67.3	5.16	
Massachusetts.					
Amherst	86	38	60.3	7.79	
Bedford	82	38	59.0	8.31	
Bluehill (summit)	83	45	58.7	6.46	
Cambridge	86	40	60.6	7.40	
Chestnuthill	85	40	60.8	8.14	
Cohasset	.....	.....	.....	6.75	
Concord	84	36	58.8	8.30	
East Templeton [*1]	84	46	60.5	5.51	
Fall River	82	46	61.2	5.14	
Fitchburg *a* [*1]	78	48	59.9	10.34	
Fitchburg *b*	84	42	59.3	8.98	
Framingham	86	37	60.1	8.55	
Groton	83	38	59.2	10.92	
Hyannis	.....	.....	.....	3.25	
Jefferson	.....	.....	.....	8.97	
Lawrence	86	38	60.2	7.53	
Leominster	.....	.....	.....	9.89	
Lowell *a*	85	40	61.4	9.11	
Lowell *b*	84	40	60.8	0.00	
Ludlow Center	83	36	55.7	8.03	
Middleboro	84	35	59.0	3.38	
Monson	82	39	59.6	5.88	
New Bedford	84	42	59.6	4.13	
Plymouth [*1]	84	48	60.4	4.76	
Princeton	.....	.....	.....	10.08	
Provincetown	79	44	59.5	3.52	
Salem	.....	.....	.....	10.48	
Somerset [*1]	89	43	64.6	5.35	
Sterling	.....	.....	.....	10.56	
Taunton	83	33	59.2	4.49	
Webster	.....	.....	.....	7.25	
Westboro	85	38	61.3	10.37	
Weston	86	36	59.1	7.93	
Williamstown	81	38	59.6	9.07	
Winchendon	.....	.....	.....	8.18	
Worcester	83	46	61.0	7.44	
Michigan.					
Adrian	90	.....	.....	2.83	
Agricultural College	.....	.....	.....	6.28	
Allegan	88[e]	31[e]	60.5[e]	2.66	

TABLE II.—*Climatological record of voluntary and other cooperating observers*—Continued.

Stations.	Temperature. (Fahrenheit.)			Precipitation.	
	Maximum.	Minimum.	Mean.	Rain and melted snow.	Total depth of snow.
Michigan—Cont'd.	°	°	°	*Ins.*	*Ins.*
Alma	87	38	61.5	2.99	
Ann Arbor	87	43	62.5	5.13	
Annpere	84	39	57.3	1.92	
Arbela	85	42	62.2	6.25	
Baldwin [1]	86	34	59.6	0.75	
Ball Mountain	85	45	60.4	5.00	
Baraga	83	24	54.2	.....	
Battlecreek	89	41	62.4	2.24	
Bay City	88	35	59.2	2.40	
Benzonia	.....	.....	.....	2.94	
Berlin	92	42	60.4	4.28	
Berrien Springs	92	39	63.2	3.42	
Big Rapids	83	34	59.8	1.93	
Birmingham	86	41	61.3	1.04	
Boon	81	32	56.0	3.20	
Calumet	81	37	59.1	1.27	
Cassopolis	92	38	64.2	3.90	
Charlevoix	80	40	58.8	2.03	
Chatham	87	26	56.0	1.71	
Cheboygan	82	36	58.8	2.10	
Clinton	90	43	63.8	3.09	
Coldwater	90	43	64.4	3.20	
Deerpark	80	34	52.8	1.71	
Detour	84	39	58.8	1.91	
Dundee	87	45	62.4	3.91	
Eagle Harbor	80	35	52.0	1.07	
East Tawas	88	37	58.4	3.66	
Eloise	89	43	62.8	4.39	
Ewen	84	23	56.0	1.14	
Fennville	85	38	61.9	2.64	
Fitchburg	87	42	60.5	3.63	
Flint	86	43	60.7	5.47	
Frankfort	75	42	55.6	0.81	
Gaylord	83	25	56.4	1.70	
Gladwin	86	39	61.2	1.75	
Grand Marais	75	36	53.6	2.56	
Grand Rapids	89	38	64.2	4.21	
Grape	89	43	62.6	2.23	
Grayling [1]	86	33	59.4	0.60	
Hagar	89	38	61.8	2.85	
Hanover	88[f]	41[f]	62.5[f]	2.63	
Harbor Beach	86	40	58.0	2.29	
Harrison	75	35	55.8	2.33	
Harrisville	80	40	57.6	3.32	
Hart	89	48	64.4	2.76	
Hastings	88	39	62.8	1.84	
Hayes	85	38	59.5	3.60	
Highland Station	.....	.....	.....	5.34	
Hillsdale	87	42	61.5	3.31	
Humboldt	88	18	53.0	.....	
Ionia	90[e]	38[e]	62.2[e]	2.50	
Iron Mountain	86	30	60.5	1.75	
Iron River	84	24	55.7	1.60	
Ironwood	83	32	58.8	1.01	
Ishpeming	84	29	55.8	1.69	
Ivan	84	33	59.6	2.71	
Jackson	91	43	64.4	3.17	
Kalamazoo	88[e]	38[e]	63.6[e]	1.80	
Lake City	85	30	62.3	1.05	
Lansing	86	43	62.4	4.16	
Lapeer [c]	86	43	59.6	5.24	
Lincoln	84	.....	.....	.....	
Ludington	85	32	61.0	2.36	
Mackinac Island	80	40	58.1	1.86	
Mackinaw	80	40	58.8	2.51	
Mancelona	90	34	61.6	0.35	
Manistique	78	36	56.4	1.51	
Marine City	89	36	60.5	2.94	
Menominee	83	35	59.4	4.76	
Midland	88	37	61.9	2.78	
Mio	82	32	58.1	2.10	
Montague	81	36	59.2	1.71	
Mount Pleasant	87	35	62.6	2.94	
Muskegon	83	44	62.2	1.60	
Newberry	89	29	60.4	.....	
Old Mission	82	41	60.0	2.32	
Olivet	85	43	62.2	2.90	
Omer	88	31	58.8	1.08	
Onaway	83	31	59.0	3.76	
Ontonagon	85	34	55.6	0.73	
Ovid	85	42	61.8	4.01	
Owosso	94	38	64.5	0.80	
Petoskey	84	35	59.2	1.45	
Plymouth	80	.....	.....	.....	
Port Austin	85	27	57.0	2.47	
Reed City	90	.....	.....	.....	
Roscommon	88	31	59.8	2.05	
Saginaw	91	41	63.4	3.61	
St. Ignace	85	.....	.....	.....	
St. Johns	87	40	62.7	.....	
St. Joseph	86	.....	.....	3.70	
Slocum	76	.....	.....	1.07	
Somerset	85	41	58.6	3.30	
South Haven	83	42	58.8	1.75	
Thomaston	85	24	56.9	0.35	
Thornville	87	45	61.6	4.95	
Traverse City	83	42	59.2	2.51	
Vassar	86	40	62.1	3.70	
Wasepi	86	40	61.8	3.50	
Waverly	83	38	61.4	1.96	
Webberville	86	41	61.1	3.99	
West Branch	85	36	60.2	2.10	
Wetmore	77	19	49.0	0.70	
Whitecloud [f]	83	30	58.0	3.94	
Whitefish Point	75	39	52.6	1.72	
Ypsilanti	86	43	61.6	3.95	
Minnesota.					
Albert Lea	84	41	64.0	3.25	
Alexandria	85	36	62.9	0.90	
Angus	86	32	60.9	0.61	
Ashby [h]	87	42	63.8	1.92	
Beardsley	86	28	62.6	3.48	
Beaulieu	84	32	61.0	0.36	
Bemidji	87	44	62.4	2.96	
Bird Island	85	39	63.2	3.58	
Blooming Prairie	82	37	62.2	2.20	
Caledonia	82	36	62.2	3.58	
Collegeville	86	40	65.2	2.25	
Crookston	89	35	63.1	0.70	
Currie	84	38	63.6	.....	
Deephaven	.....	.....	.....	1.32	
Detroit	85	31	61.4	1.03	
Duluth (sub station)	82	34	58.1	0.83	
Faribault	86	35	62.6	0.85	
Farmington	83	37	62.8	1.10	
Fergus Falls	87	38	64.5	1.52	
Floodwood	85	25	58.3	1.40	
Glencoe	84	38	63.4	2.25	
Grand Meadow	89	37	63.5	1.99	
Hallock	87	32	61.8	2.55	
Lake Winnibigoshish	83	33	60.6	1.20	
Leech	85	29	60.4	0.92	
Long Prairie	88	32	61.6	1.44	
Luverne	85	38	62.5	2.12	
Lynd	83	35	62.3	5.22	
Mapleplain	88	36	65.4	1.26	
Milaca	89	30	60.4	1.26	
Milan	85[k]	36[k]	63.1[k]	3.78	
Minneapolis [i]	89[e]	35	65.3	1.60	
Montevideo	86	36	63.0	2.39	
Morris	86	36	63.4	1.48	
Mount Iron	85	27	59.8	1.63	
New London	90	36	64.3	2.34	
New Richland	88	40	64.2	2.16	
New Ulm	90	41	67.2	3.20	
Park Rapids	85	33	60.6	1.79	
Pine River	90	30	62.8	1.46	
Pipestone	81	35	61.0	2.83	
Pleasant Mounds	83	41	63.2	2.96	
Pokegama Falls	85	25	58.8	1.30	
Redwing *a*	.....	.....	.....	0.41	
Redwing *b*	84	38	64.6	1.96	
Reeds	.....	.....	.....	1.88	
Rolling Green	85	40	64.1	2.92	
St. Cloud	86	40	64.2	1.28	
St. Peter	86	40	64.4	2.82	
Sandy Lake Dam	88	30	61.0	1.59	
Shakopee	83	39	64.1	1.95	
Thief River Falls	83	35	61.7	1.10	
Tower	87	28	56.4	1.30	
Two Harbors	87	32	55.2	2.98	
Wabasha	90	37	65.5	2.21	
Warroad	85	34	62.4	.....	
Willow River	90	28	60.7	1.65	
Winnebago	90	40	65.4	1.41	
Winona	85	40	63.8	2.09	
Worthington	84	38	63.2	4.60	
Wyoming	.....	.....	.....	1.81	
Zumbrota	85	35	62.6	.....	
Mississippi.					
Aberdeen	96	45	73.5	3.25	
Agricultural College	93	50	72.6	2.36	
Austin	89	46	70.9	2.70	
Batesville	93	47	71.6	4.97	
Biloxi	95	60	77.6	2.55	
Boggan	98	48	74.3	1.04	
Booneville	90	48	70.6	3.88	
Brookhaven	97	51	74.9	2.60	
Canton	98	49	73.8	3.41	
Columbus	93	50	71.8	2.18	
Corinth	90	46	68.4	4.30	
Crystal Springs	93	50	73.4	4.44	
Duck Hill	95	45	71.8	1.15	
Edwards	95	47	74.8	1.55	
Fayette	92	48	73.2	3.90	
Fayette (near)	.....	.....	.....	3.29	
Greenville *a*	91	54	73.4	2.07	
Greenville *b*	98	53	75.2	2.05	
Greenwood	96	50	72.6	2.64	
Hattiesburg	98	52	77.0	4.35	
Hazlehurst	96	49	74.2	5.45	
Hernando	95	50	71.5	1.35	
Holly Springs	93	50	71.4	1.67	
Indianola	95	50	71.4	4.41	
Jackson	94	49	73.5	2.56	
Kosciusko	95	48	73.0	1.90	
Lake	95	49	73.0	4.59	
Lake Como	96	47	73.6	2.48	
Laurel	101	51	77.2	3.12	
Louisville	95	48	71.9	2.16	
McNeill	97	54	76.8	4.39	
Macon	98	51	74.8	1.75	
Magnolia	95	50	74.8	5.09	
Natchez	94	51	74.8	6.58	
Nittayuma	96	50	74.8	2.24	
Patmos	.....	.....	.....	1.34	
Pearlington	95[c]	55[c]	77.0[c]	3.12	
Pittsboro	94	47	71.6	3.72	
Pontotoc	90	49	70.6	3.03	
Poplarville	98	54	77.6	4.05	
Port Gibson	94	49	74.0	2.96	
Ripley	93	45	68.8	1.45	
Shoccoe	97	48	73.6	2.80	
Suffolk	92	49	73.2	4.53	
Swartwout	95	53	75.8	4.87	
Thornton	94	54	75.8	3.12	
Tupelo	95	49	71.7	3.26	
University	93	48	71.6	2.80	
Walnutgrove	100	44	73.4	2.78	
Watervalley	95	48	70.7	4.45	
Waynesboro	95	50	74.6	3.01	
Westpoint	93	49	73.8	2.40	
Woodville	93	53	74.4	4.74	
Yazoo City	97	50	74.5	1.21	
Missouri.					
Arthur	90	44	67.8	7.74	
Avalon	94	40	69.0	1.77	
Bagnell	.....	.....	.....	2.60	
Bethany	94	40	65.2	1.22	
Birchtree	88	44	67.4	3.91	
Blue Springs	90	41	65.6	1.91	
Boonville	.....	.....	.....	4.10	
Brunswick	93	40	67.6	2.62	
Carrollton	91[d]	43[d]	68.2[d]	2.54	
Caruthersville	95	47	70.8	1.68	
Conception	91	42	66.8	1.54	
Darksville	89	40	66.3	4.26	
Dean	90	40	66.2	2.55	
Desoto	88	45	66.8	2.91	
Downing	.....	.....	.....	3.05	
Edgehill	88	37	65.8	3.04	
Edwards	90	38	66.6	5.86	
Eightmile [e] [3]	.....	50	67.8	3.88	
Fairport	.....	.....	.....	1.40	
Fayette	91	43	68.2	4.16	
Fulton	91	40	67.8	2.83	
Gallatin [e] [1]	94	48	68.8	2.18	
Glasgow	91	43	67.6	2.69	
Gorin	.....	.....	.....	3.03	
Grant City	92	42	65.7	2.37	
Halfway	88	43	66.6	5.60	
Harrisonville	92	43	67.8	3.56	
Hazlehurst	.....	.....	.....	2.44	
Hermann	.....	.....	.....	2.34	
Houston	90	40	67.5	3.17	
Huntsville	91	40	66.6	3.63	
Ironton	93	36	67.7	3.77	
Jackson	91	40	68.8	2.34	
Jefferson City	93	45	67.9	2.25	
Joplin	89	46	68.6	3.37	
Kidder	92	42	66.4	2.17	
Koshkonong	89	42	67.8	2.11	
Lamar	91	45	68.6	2.34	
Lamonte	.....	.....	.....	2.95	
Lebanon	90	43	67.4	5.79	
Lexington	91	43	67.5	3.03	
Liberty	92	42	67.2	3.07	
Louisiana	90	40	66.4	3.61	
Macon	92	39	67.2	4.07	
Marblehill	91	40	68.0	3.12	
Marshall	89	42	66.7	4.07	
Maryville	90	42	65.5	2.45	
Mexico	92	39	67.1	6.32	
Miami [e] [5]	92	51	69.8	3.23	
Mineralspring	89	43	66.5	1.90	
Monroe City	91	39	66.4	2.60	
Montreal	90	36	64.6	2.78	
Mountaingrove	87	43	66.1	3.67	
Mount Vernon	90	42	67.2	1.80	
Neosho	90	40	66.4	2.18	
Nevada	90	45	70.3	5.48	
New Haven	90	45	69.2	2.71	
New Madrid *b*	.....	.....	.....	2.25	
New Palestine	91	44	67.4	3.60	
Oakfield	88	45	68.1	2.53	
Olden	90	41	68.0	2.21	
Oregon	91	44	66.6	3.94	
Palmyra	88	44	66.0	2.33	
Pine Hill	.....	.....	.....	2.48	
Princeton	95	42	67.0	4.23	
Protem	91	44	68.0	3.11	
Rockport	.....	.....	.....	1.69	
Rolla	.....	.....	.....	4.24	
St. Charles	90	46	68.8	4.95	

TABLE II.—*Climatological record of voluntary and other cooperating observers*—Continued.

Stations.	Temperature. (Fahrenheit.)			Precipitation.	
	Maximum.	Minimum.	Mean.	Rain and melted snow.	Total depth of snow.
Missouri—Cont'd.	°	°	°	*Ins.*	*Ins.*
St. Joseph				3.28	
Sarcoxie				2.36	
Sedalia	90	45	67.1	3.74	
Seymour	87	41	65.3	8.30	
Shelbina				2.92	
Sikeston	89	43	68.3	3.80	
Steffenville	91	41	66.0	2.82	
Sublett	91	39	65.6	4.87	
Trenton	91	43	67.6	2.68	
Unionville	92	42	67.0	3.85	
Vichy	89	39	66.2	4.59	
Warrensburg	91	45	67.6	3.72	
Warrenton	91	39	67.8	3.12	
Wheatland				3.68	
Willowsprings	88	39	66.2	3.13	
Windsor	88	43	66.0	3.18	
Zeitonia	95	38	68.1	2.79	
Montana.					
Anaconda	90	40	62.2		
Augusta	86	32	60.0	1.36	
Billings	95	26	60.4		
Boulder	86	32	59.0	0.85	
Bozeman	82	39	59.6	9.45	
Butte	84	38	59.5	0.80	
Canyon Ferry	89	41	64.7	1.28	
Chester	90			0.04	
Chinook	93	36	64.6		
Columbia Falls	87	33	61.2	1.53	
Culbertson	89	29	63.5	2.46	
Crow Agency	95	37	66.6	2.05	
Dayton	87	39	61.3	2.50	
Deerlodge	85	38	59.2		
Dillon	82	33	58.4	1.64	
Fort Benton				1.43	
Fort Harrison	85	42	63.1		
Glasgow	96	33	65.2		
Glendive	95	32	64.8	1.30	
Greatfalls	87	40	65.0	2.19	
Hamilton	89	41	62.4	1.41	
Hayden	92	37	63.3	2.54	
Kipp[2]	86	30	57.4		
Lamedeer	96	32	65.3	1.81	
Lewistown	85	37	60.6	1.75	
Livingston	87			3.24	
Manhattan	89	35	63.0	1.67	
Marysville[3]	80	35	57.9		
Missoula	92	45	65.8	2.24	
Ovando	89	31	57.4	2.52	
Parrot	86	41	63.2	2.21	
Plains	88	40	60.8	2.12	
Poplar	92	34	63.1	2.33	
Redlodge	83	27	57.0	2.06	
Ridgelawn	89	33	63.8	1.82	
St. Pauls	86	34	62.0	1.86	
St. Peter	81	29	57.0	2.31	
Springbrook	95	29	64.1	2.09	
Toston	91	26	57.0	1.39	
Townsend				0.90	
Twin Bridges	89	34	60.6		
Twodot	87	32	62.2	2.19	
Utica	89	35	61.9	2.81	
Wolf Creek	85	34	60.6	1.91	
Wolsey	83	26	55.2	1.12	
Yale	90	32	60.0	1.07	
Nebraska.					
Agate	98	29	60.3	1.97	
Agee[*1]	96	46	65.4	1.63	
Albion	91	36	63.4	2.20	
Alliance	96	35	64.8	1.40	
Alma	98	38	66.0	2.03	
Ansley	95	34	63.7	2.90	
Arapahoe				2.40	
Arcadia				2.52	
Ashland *a*	96	42	67.1	2.30	
Ashland *b*				2.65	
Ashton				2.06	
Auburn	96	40	66.7	1.88	
Aurora	98	40	66.4	3.10	
Bartley	97	40	65.0	1.31	
Beatrice	96	41	66.0	2.84	
Beaver	95	42	64.8	1.85	
Bellevue				3.13	
Benedict				1.45	
Benkleman				2.34	
Blair	95	39	65.2	3.20	
Bluehill				4.13	
Bradshaw				2.64	
Bridgeport	93	36	62.5	1.00	
Brokenbow	93	35	63.2	2.32	
Burchard				3.92	
Burwell				0.96	
Callaway	91	32	64.6	2.25	
Cedar Rapids	96	42	64.2	1.10	
Central City				3.04	
Chester				4.82	
Cody				1.02	
Columbus	95	41	66.5	0.84	
Crete	94	43	65.8	2.43	

Stations.	Temperature. (Fahrenheit.)			Precipitation.	
	Maximum.	Minimum.	Mean.	Rain and melted snow.	Total depth of snow.
Nebraska—Cont'd.	°	°	°	*Ins.*	*Ins.*
Culbertson				1.75	
Curtis	91[b]	40[b]	62.5[b]	4.04	
Dannebrog				2.65	
David City	95	40	65.0	1.77	
Dawson	93	43	67.4	3.01	
Edgar				1.70	
Ericson				1.60	
Ewing				2.32	
Fairbury	98	39	65.8	1.64	
Fairmont	94	39	64.4	2.98	
Fort Robinson	95	32	62.2	0.71	
Fremont	94	39	66.2	3.15	
Geneva	95	41	65.4	3.15	
Genoa (near)	93	39	66.3	1.32	
Gering	93	36	63.0	1.95	
Gordon				1.40	
Gosper				3.00	
Gothenburg	93	35	64.0	3.38	
Grand Island *a*				3.78	
Grand Island *b*	95	39	65.6	3.11	
Grand Island *c*	99	40	67.1	2.43	
Greeley				1.20	
Guide Rock				1.86	
Haigler				1.76	
Halsey	95	37	64.1	1.25	
Hartington	93	35	64.5	3.68	
Harvard	92	39	64.1	1.86	
Hastings[*1]	96	45	64.0	3.35	
Hayes Center				0.94	
Hay Spring	91	36	59.8	2.16	
Hebron	94	40	65.8	2.29	
Hickman				3.50	
Holbrook				2.03	
Holdrege				2.48	
Hooper[*1]	96	48	67.0	3.35	
Imperial	95	38	63.4	1.33	
Johnstown				0.88	
Kearney	94	42	64.8	4.63	
Kennedy	92	37	63.7	2.35	
Kimball	96	38	61.4	1.38	
Kirkwood	91	35	64.6	2.44	
Leavitt	96	40	68.7	1.91	
Lexington	93	38	63.4	3.18	
Lockridge	97	37	64.8	2.26	
Lodgepole	91	33	60.8	0.84	
Loup	94	34	64.2	2.13	
Lynch	96	33	65.4	3.11	
Lyons				3.19	
McCool Junction				1.56	
Madison	93	38	64.3	1.86	
Madrid	90	32	61.2	1.47	
Marquette				2.14	
Mason				2.81	
Minden	92	39	63.4	2.67	
Monroe				1.54	
Nebraska City *c*	93	40	66.0	1.62	
Nemaha				3.45	
Norfolk	97	35	65.0	3.02	
North Loup	94	36	65.7	2.38	
Oakdale	94	36	65.0	4.30	
Odell				5.68	
O'Neill	93	38	64.6	1.33	
Ord				2.14	
Osceola				1.98	
Palmer				1.95	
Palmyra[*1]	92	48	66.7	3.75	
Pawnee City				2.44	
Plattsmouth *a*				1.69	
Plattsmouth *b*	98	41	67.4	1.54	
Purdum	91[1]	38	65.6[6]	1.22	
Ravenna *a*	92	36	64.2	3.94	
Ravenna *b*				3.19	
Redcloud				2.16	
Rulo				4.67	
St. Libory				2.33	
St. Paul	95	37	65.7	3.06	
Salem				2.40	
Santee	91	39	67.2	2.80	
Schuyler				1.03	
Seward	96	46	69.4	3.07	
Smithfield				3.74	
Spragg				0.89	
Springview	91[4]	36[4]	62.4[4]	1.68	
Stanton	95	36	64.8	2.27	
Strang				2.17	
Stratton				1.16	
Superior	96	42	65.6	2.25	
Syracuse				2.67	
Tablerock				3.45	
Tecumseh *b*	98	49	69.6	2.22	
Tecumseh *c*				2.95	
Tekamah	94	35	67.1	3.24	
Turlington	96	44	66.5	1.97	
University Farm	94	40	66.0	2.49	
Wahoo				2.46	
Wakefield	93	35	64.8	3.19	
Wallace				1.30	
Weeping Water	91	37	63.6	3.19	

Stations.	Temperature. (Fahrenheit.)			Precipitation.	
	Maximum.	Minimum.	Mean.	Rain and melted snow.	Total depth of snow.
Nebraska—Cont'd.	°	°	°	*Ins.*	*Ins.*
Westpoint	96	39	66.4	2.28	
Wilber[*1]	94	42	67.9	1.32	
Willard				3.61	
Wilsonville				1.45	
Winnebago	92	38	63.2	4.12	
Wisner				2.44	
Wymore				4.19	
York				1.61	
Nevada.					
Austin	86	41	63.0	0.60	
Battle Mountain	97	42	70.7	0.34	
Belmont	97	37	62.9	0.80	
Beowawe[*1]	97	54	72.8	0.43	
Caliente	104	40	71.0	0.00	
Candelaria	94	46	68.8	0.39	
Carlin[*1]	96	38	69.6	0.00	
Carson City	91	32	62.2	0.02	
Cranes Ranch				0.75	
Elko	92	37	63.3	1.60	
Ely	93	40	62.2	0.18	T.
Eureka	95	40	64.0	0.10	
Failon	95	39	67.2	0.30	
Fenelon				1.50	
Golconda[*1]	95	60	74.2	0.30	
Halleck[*5]	94	48	71.2		
Hamilton	85	28	53.2	0.78	T.
Hawthorne	97	45	67.6	0.00	
Humboldt	95	44	67.2	1.35	
Lee				0.54	
Lewers Ranch	90	35	63.2	T.	
Lovelocks	97	38	61.2	0.00	
McAfee Ranch	97	40	65.8	0.30	
Martins	93	33	64.2	0.00	
Mill City[*1]	94	53	69.8	0.00	
Morey	98	38	65.1	0.65	
Palmetto	93	36	61.4	1.54	
Potts	94	32	62.3	0.55	
Reno State University	94	34	63.4	0.22	
Rioville	113	58	84.8	0.07	
Silverpeak	101	45	73.2	0.16	
Sodaville	102	46	71.8	0.47	
Tecoma	99	40	66.9	T.	
Wabuska	100	32	66.4	0.09	
Wadsworth	98	34	68.4	0.00	
Wood	93	37	62.0	0.33	
New Hampshire.					
Alstead	81	38	61.0	7.37	
Berlin Mills	80	30	57.8	6.91	
Bethlehem	81	36	58.4	3.64	
Brookline[*1]	88	46	61.9	10.25	
Chatham	82	37	57.4	12.47	
Concord	83	35	59.0	8.57	
Durham	84	36	58.4	7.70	
Franklin Falls	81	40	58.2	8.98	
Grafton	84	29	57.4	8.07	
Hanover	84	34	60.4	6.14	
Keene	85	34	59.6	6.17	
Littleton	82	38	55.3	5.72	
Nashua	86	37	60.2	7.69	
Newton	85	32	57.4	9.60	
Plymouth	88	31	59.4	6.34	
Sanbornton	81	36	57.8	7.02	
Stratford	85	31	59.2	3.18	
New Jersey.					
Asbury Park	87	50	62.6	6.98	
Barnegat	84	45	63.5	5.68	
Bayonne	86	48	63.4	9.33	
Bergen Point	85	47	63.0	10.95	
Beverly	87	47	65.9	6.05	
Blairstown	87	40	63.4	12.69	
Bridgeton	89	47	67.2	3.46	
Camden	84	51	65.6	7.30	
Canton				3.42	
Cape May C. H.	83	48	65.0	2.39	
Charlotteburg	85	37	61.3	9.45	
Chester	82	44	61.6	12.80	
Clayton	85	46	64.4	3.09	
College Farm	87	46	64.0	7.35	
Dover	86	40	61.2	15.02	
Elizabeth	87	47	64.4	8.76	
Englewood	87	49	64.0	8.15	
Flemington	87	45	65.1	9.81	
Friesburg	88	46	65.3	3.27	
Hightstown	85	47	64.4	8.04	
Imlaystown	86	46	65.8	6.94	
Indian Mills	87	44	64.8	4.57	
Lakewood	84	45	62.7	6.62	
Lambertville	84	43	65.7	7.05	
Layton	85	37	61.1	11.78	
Moorestown	85	45	65.0	5.65	
Newark	86	46	62.8	11.51	
New Brunswick	88	47	65.2	8.13	
Newton	86	42	62.9	12.83	
Oceanic	84	50	63.0	10.00	
Paterson	92	46	64.4	11.17	
Pemberton	85	44	65.4	8.19	
Perth Amboy	86	51	66.1	9.51	
Phillipsburg	85	47	64.9	9.09	

TABLE II.—*Climatological record of voluntary and other cooperating observers*—Continued.

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
New Jersey—Cont'd.	°	°	°	*Ins.*	*Ins.*
Plainfield	86	44	63.8	10.14	
Rancocas				4.58	
Ringwood	88	38	62.0	10.13	
Rivervale	85	42	62.6	10.62	
Salem	90	46	66.6	2.48	
Somerville	89	43	63.9	11.66	
South Orange	84	46	63.0	9.28	
Sussex	86	42	62.4	14.87	
Toms River	88	41	63.8	7.18	
Trenton	83	53	66.4	8.09	
Tuckerton	85	44	64.6	8.02	
Vineland	84	45	64.6	2.61	
Woodbine	84	42	63.8	3.53	
Woodstown				3.10	
New Mexico.					
Alamagordo	108	49	75.6	1.30	
Albert	100	46	66.2	5.90	
Albuquerque	99	48[1]	68.4[2]	2.48	
Alma	101	30	66.6	1.21	
Arabela	93	43	63.6	6.81	
Bellranch				5.09	
Cambray				0.43	
Carlsbad	103	49	74.0	4.55	
Deming				3.32	
Dorsey	90	34	60.2	8.60	
Eagle Rock Ranch	87	32	58.6	5.34	
Engle	100	48	68.6	2.39	
Fort Bayard	103	44	68.6	1.75	
Fort Stanton	92	41	60.4	3.41	
Fort Union	90	38	58.0	6.69	
Fort Wingate	89	42	62.7	1.36	
Gallisteo				3.10	
Golden				3.17	
Hot Springs	90	40	58.3		
Las Vegas	95	40	59.8	6.24	
Lordsburg				0.58	
Los Lunas	98	48	72.0	2.05	
Luna	95	35	60.7	3.02	
Mesilla Park	103	45	72.2	3.65	
Mountainair	95	41	61.8	2.96	
Raton	94	35	61.6	9.44	
Roswell	97	48	69.4	4.37	
San Marcial	105	51	73.8		
Strauss				2.82	
Taos	97	40	61.7	3.56	
Winsors	83	32	52.0	5.29	
New York.					
Adams				4.46	
Addison	87	38	62.0	5.90	
Akron				3.36	
Alden	84	42	61.9	4.80	
Amsterdam				10.37	
Angelica	84	33	58.7	4.54	
Appleton	88	40	60.7	2.92	
Arcade	83	34	58.2	4.14	
Athens	87	44	62.4	7.93	
Atlanta	85	36	59.3	4.66	
Auburn	86	41	62.8	7.04	
Avon	88	35	61.6	4.03	
Axton	84	22	55.8	5.56	
Baldwinsville	85	43	62.3	7.20	
Beaver	83	25	57.1	5.18	
Bedford	86	44	61.9	10.46	
Berlin	83	35	59.4	8.32	
Blue Mountain Lake				6.75	
Bolivar	85	35	58.5	5.60	
Bouckville	82	42	60.3	10.25	
Boyds Corner				11.81	
Brockport	89	37	62.6	2.62	
Brown Station				12.36	
Caldwell	86	39	60.1	8.31	
Canajoharie	84	36	60.3	9.41	
Canaan Four Corners	82	38	59.0	10.86	
Carmel	83	46	62.0	12.70	
Carvers Falls	84	35	60.4	4.29	
Cedarhill	87	40	62.2	7.26	
Chazy	83	33	62.2	6.54	
Clockville				7.83	
Cooperstown	81	40	59.4	7.35	
Cortland	84	40	61.7	6.12	
Cutchogue	82	45	61.6	6.08	
Dekalb Junction	85	33	61.7	4.73	
De Ruyter	82	36	58.5	6.87	
Easton				7.18	
Elba	80	40	59.6	3.17	
Elmira	90	35	62.9	7.18	
Fayetteville	86	40	62.6	7.27	
Franklinville	83	35	58.6	3.42	
Gabriels	82	28	55.8	4.55	
Gansevoort				8.14	
Glens Falls	88	37	61.0	8.97	
Gloversville	85	38	60.0	9.44	
Greenwich	85[a]	38[a]	61.0[a]	5.97	
Griffin Corners	81	32	56.5	6.63	
Harkness	84	41	61.6	6.19	
Haskinville				6.26	
Hemlock	84	40	62.6	6.32	
Homer	84	36	59.4	6.09	

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
New York—Cont'd.	°	°	°	*Ins.*	*Ins.*
Honeymead Brook	83	42	61.0	12.23	
Indian Lake	79	30	55.3	6.47	
Ithaca	85	43	60.8	5.67	
Jamestown	86	38	61.2	3.58	
Keene Valley	84	31	58.7	9.25	
King Ferry				6.43	
Liberty	80	44	59.0	9.34	
Littlefalls, City Res.	82	47[a]	60.6[a]	6.98	
Lockport	83	40	62.3	3.21	
Lowville	83	33	59.6	5.83	
Lyndonville				2.53	
Lyons	89	42	64.4	6.14	
Middletown	78	49	61.6	12.06	
Mohonk Lake	80	44	58.6	12.44	
Moira	84	35	62.2	6.71	
Mount Etrick	80	42	59.6	6.95	
Newark Valley				6.84	
New Lisbon	81	34	57.8	7.04	
North Hammond				5.53	
North Lake				6.74	
Number Four	83	34	58.8	7.21	
Nunda	89	35	61.6	4.01	
Ogdensburg	86	38	62.8	8.53	
Old Chatham				7.09	
Oneonta	85	33	60.3	6.83	
Oswegatchie	81	41	60.6	8.71	
Otto	81	45	61.6	5.16	
Oxford	82	38	60.6	7.56	
Oyster Bay	88	39	61.4	10.20	
Palermo				6.48	
Penn Yan	86	40	62.8	6.14	
Perry City	86	35	60.3	7.04	
Plattsburg	85	36	60.4	4.45	
Port Jervis	85	42	61.6	13.76	
Potsdam	85	34	62.0	6.00	
Primrose	87	41	61.7	9.44	
Redhook				9.95	
Richmondville	85	36	59.9	8.84	
Ridgeway	83[a]	40	61.2[a]	3.66	
Rome	83	43	63.2	7.25	
Romulus	86	42	63.2	10.74	
Salisbury Mills				12.52	
Saranac Lake	82	29	58.1	4.49	
Saratoga Springs	87	38	61.2	7.92	
Scottsville				3.53	
Setauket	83	45	61.2	7.84	
Shokan				7.52	
Shortsville	85	40	61.6	5.19	
Skaneateles				6.10	
Southampton	82	45	61.0	4.67	
South Butler				7.38	
South Canisteo	84	42[a]	60.8	5.49	
Southeast Reservoir				11.35	
South Kortright	84	34	58.6	6.21	
South Schroon	80	32	57.6	8.91	
Speer Falls	87	40	60.9	7.53	
Straits Corners	84	33	58.4	6.18	
Ticonderoga	83	39	61.6	5.80	
Volusia	80	45	59.6	6.05	
Walton	84	34	59.3	7.29	
Wappinger Falls	82	42	61.5	20.63	
Warwick				10.20	
Watertown	87	40	62.6	4.78	
Waverly	89	35	62.4	6.67	
Wedgwood	84	41	59.4	5.53	
Wells	84	30	58.1	8.52	
West Berne	82	31	57.6	6.55	
Westfield *b*	82	47	61.8	4.91	
Westfield *c*	83[a]	46[a]	61.0[a]	3.14	
Windham	85	33	59.6	8.09	
Youngstown				2.91	
North Carolina.					
Brevard	84	38	63.6	12.00	
Brewers	90	45	67.6	8.28	
Bryson City				7.60	
Chapelhill	93	46	72.0	4.87	
Currituck				4.40	
Edenton	95	50	73.0	4.00	
Fayetteville	92	51	72.8	4.42	
Flatrock	83[a]	38[a]	64.2[a]	11.15	
Goldsboro	88	51	72.2	6.07	
Graham				2.84	
Greensboro	86	48	69.6	4.99	
Henderson	91	48	71.0	3.77	
Hendersonville	86	41	66.1	7.01	
Henrietta	91	44	71.0	10.90	
Highlands	82	32	59.6	13.85	
Jefferson	82	42	62.4	4.69	
Lenoir	89	42	68.9	9.03	
Linville	76	33	57.9	5.51	
Littleton	90	52	70.2	4.72	
Louisburg	95	48	71.4	4.44	
Lumberton	91	54	74.4	6.44	
Marion	90	44	68.3	10.13	
Mocksville	90			6.11	
Moncure	93	45	72.4	3.68	
Monroe	90	43	70.2	11.07	
Morganton	89	45	69.6	7.89	

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
North Carolina—Cont'd.	°	°	°	*Ins.*	*Ins.*
Mountairy	90	49	69.0	2.13	
Murphy				6.61	
Newbern	89	49	73.4	4.60	
Patterson[a]	82	40	63.2	8.37	
Penelo	89	49	70.9	5.97	
Pittsboro	94	45	72.2	1.92	
Reidsville	90	44	69.6	8.39	
Rockingham	93	50	73.3	5.60	
Roxboro	88	46	69.5	4.53	
Salem	93	45	70.4	7.75	
Salisbury	93	49	72.8	3.34	
Saxon	85	40	68.4	8.24	
Selma	94	46	72.2	5.19	
Settle	92	46	72.1	5.89	
Sloan	91[c]	58[c]	74.6[c]	4.68	
Soapstone Mount	90	44	69.8	3.38	
Southern Pines *a*	94	50	73.9	8.13	
Southern Pines *b*	91	49	73.2	6.68	
Southport	90	54	75.4	7.04	
Springhope	91	50	71.8	6.03	
Statesville	90	41	69.6	4.52	
Tarboro	92	46	73.2	5.26	
Washington	98	51	76.3	5.26	
Waynesville	86	41	63.8	4.27	
Weldon *a*	89	50	71.1	9.84	
Weldon *b*				10.01	
North Dakota.					
Amenia	89	33	62.6	0.54	
Ashley	92	30	60.5	1.48	
Berlin	90	31	60.3	1.80	
Bottineau	85	36	61.3	1.38	
Buxton	86	34	62.2	0.29	
Cando	90	32	61.4	1.78	
Churchs Ferry [4]	88	35	62.7	0.99	
Dickinson	94	31	63.4	1.18	
Donnybrook				2.51	
Dunseith	91	35	61.3	1.16	
Edgeley	87	36	63.3	1.57	
Ellendale	94	35	64.0	1.14	
Fargo	87	33	62.3	0.56	
Forman	90	33	63.6	2.99	
Fort Yates	94	36	66.0	2.08	
Fullerton	91	32	62.1	1.62	
Gallatin	85	34	59.9	0.40	
Glenullin	94	34	63.5	2.69	
Grafton	89	33	63.8	0.99	
Jamestown	90	29	61.2	0.51	
La Moure				1.48	
Larimore	89	34	61.4	0.70	
Libson	86	31	62.0	2.41	
McKinney	89	32	60.6	1.85	
Manfred	90	35	62.5	1.62	
Mayville	87	27	58.8	0.04	
Medora	87	32	64.1	2.32	
Melville	95[d]	35[d]	65.0[d]	0.48	
Milton	92	35	61.5	1.65	
Minnewaukon	90	36	63.6	1.20	
Minot	96	40	67.4	1.95	
Minto	89	32	62.0	0.65	
Napoleon	96	33	63.8	1.94	
New England	88[b]	38[b]	60.3[b]	1.25	
Oakdale	87	34	62.6	2.26	
Pembina	90	32	62.4	2.54	
Portal	84	31	59.2	3.13	
Power	90	32	63.8	0.74	
Steele	93	38	64.1	1.35	
University	86	34	61.2	0.49	
Willow City	86	38	60.8	1.98	
Wishek	95	33	66.4	2.05	
Ohio.					
Akron	90	47	62.6	2.46	
Bangorville	87	42	63.4	3.85	
Bellefontaine	87	41	63.0	5.41	
Bement				2.89	
Benton Ridge	90	46	64.5	2.45	
Bloomingburg				4.23	
Bowling Green	90	44	63.6	2.77	
Bucyrus	88	44	64.2	4.24	
Cambridge	85	40	64.8	4.26	
Camp Dennison	90	43	67.3	3.40	
Canal Dover	89	44	63.4	4.21	
Canton	85	45	63.2	3.47	
Cardington	89	43	63.0	3.69	
Cedarville				3.23	
Chillicothe	85	45	69.0	2.69	
Circleville	87	45	65.6	3.92	
Clarington	85	45	66.1	4.50	
Clarksville	89	43	66.0	4.69	
Cleveland *a*	84	49	62.8	3.74	
Cleveland *b*	87	49	62.6	2.53	
Clifton	84	42	64.2	4.70	
Coalton	90	42	66.5	3.50	
Colebrook [4]	85	42	61.0		
Dayton *a*				6.65	
Dayton *b*	88	42	66.0	9.09	
Defiance	89	44	63.6	4.50	
Delaware	88	44	64.4	4.97	
Elyria	89	45	62.8	3.83	

TABLE II.—*Climatological record of voluntary and other cooperating observers*—Continued.

Stations.	Temperature. (Fahrenheit.)			Precipitation.	
	Maximum.	Minimum.	Mean.	Rain and melted snow.	Total depth of snow.
Ohio—Cont'd.	°	°	°	*Ins.*	*Ins.*
Findlay	94	46	64.9	4.29	
Frankfort	85	44	64.8	2.42	
Fremont	89	46	64.0	4.88	
Garrettsville	86	41	61.5	5.02	
Granville	87	44	64.4	2.71	
Gratiot	86	44	64.6	3.22	
Green	87	42	67.4	4.00	
Greenfield	87	45	66.4	3.57	
Greenhill	84	38	61.4	4.77	
Greenville	90	41	64.8	2.99	
Hanging Rock	90	45	68.0	3.58	
Hedges	91	43	64.0	4.51	
Hillhouse	85	41	59.6	6.04	
Hiram	85	46	62.2	4.21	
Jacksonboro	89	45	67.2	3.83	
Kenton	89	44	63.9	5.17	
Killbuck	86	38	62.5	3.73	
Lancaster	86	44	65.3	4.03	
Lima	83	44	64.1	3.65	
McConnelsville	86	44	64.4	3.27	
Manara[e]	85	44	65.2	.....	
Mansfield	.....	.....	.....	4.40	
Marietta	85	47	67.0	4.68	
Marion	90	43	64.6	5.35	
Medina	88	43	64.6	4.37	
Milfordton	87	43	63.7	2.37	
Milligan	86	40	64.5	3.21	
Millport	84	35	61.1	3.86	
Montpelier	88	42	62.6	3.29	
Napoleon	89	46	64.0	4.92	
New Alexandria	85	45	65.0	4.10	
New Berlin	88	43	62.8	3.64	
New Bremen	90	42	64.4	2.92	
New Richmond	90	43	67.2	2.25	
New Waterford	88	42	63.6	6.51	
North Lewisburg	86	45	64.1	3.85	
North Royalton	95	44	64.0	4.42	
Norwalk	94	43	64.1	3.34	
Oberlin	89	44	62.4	3.43	
Ohio State University	85	46	64.5	3.14	
Orangeville	87	41	62.2	5.72	
Ottawa	92	40	64.5	3.63	
Pataskala	86	45	64.6	5.31	
Philo	88	44	65.9	2.54	
Plattsburg	88	41	64.8	5.47	
Pomeroy	89	45	67.0	4.49	
Portsmouth *a*	.....	.....	.....	4.52	
Portsmouth *b*	89	41[d]	68.4	4.16	
Pulse	86	43	65.8	2.54	
Richwood	88	45	64.0	4.55	
Ripley	87	41	65.0	2.02	
Rittman	90	40	64.6	4.84	
Rockyridge	91	45	63.6	4.11	
Shenandoah	87	42	61.8	3.80	
Sidney	91	44	65.4	3.00	
Somerset	89	44	66.0	3.82	
Springfield	.....	.....	.....	5.22	
Strongsville	.....	.....	.....	3.78	
Thurman	89	43	67.6	4.88	
Tiffin	90	46	63.6	4.29	
Upper Sandusky[4]	89	44	66.2	.....	
Urbana	84	43	63.2	6.33	
Vickery	90	42	62.5	3.32	
Walnut	.....	.....	.....	5.14	
Warren	87	43	62.4	4.09	
Warsaw	89	40	63.6	4.35	
Wauseon	92	45	64.4	2.77	
Waverly	90	43	67.2	2.94	
Waynesville	86	43	64.8	7.89	
Wellington	91	45	63.2	3.27	
Willoughby	.....	.....	.....	3.62	
Wooster	88	41	63.0	3.69	
Zanesville	.....	.....	.....	3.07	
Oklahoma.					
Arapaho	94	43	69.9	1.45	
Beaver	100	39	67.6	1.35	
Binger	92	44	67.9	2.24	
Blackburn	95	45	68.8	2.75	
Burnett	95	45	71.0	1.18	
Chandler	94	47	70.6	3.43	
Cleo	95	40	69.3	2.64	
Clifton	95	45	69.8	4.19	
Cloud Chief	93	41	68.8	1.05	
Eldorado	101	47	72.8	2.13	
Enid	94	43	68.0	0.94	
Fort Reno	94	47	71.0	0.67	
Fort Sill	95	46	71.0	2.17	
Grand	96	44	70.0	2.73	
Guthrie	93	47	70.3	2.03	
Hennessey	95	47	70.4	2.33	
Hobart[f]	98	49	72.6	1.07	
Jefferson	96	44	69.1	1.83	
Jenkins	96	43	69.0	2.23	
Kenton	100	35	66.3	3.06	
Kingfisher	94	46	71.0	1.84	
Leger	.....	.....	.....	1.03	
Mangum	100	52	73.0	2.40	
Newkirk	94	38	66.2	1.26	

Stations.	Temperature. (Fahrenheit.)			Precipitation.	
	Maximum.	Minimum.	Mean.	Rain and melted snow.	Total depth of snow.
Oklahoma—Cont'd.	°	°	°	*Ins.*	*Ins.*
Norman	94	.....	.....	1.90	
Okeene	97	35	71.0	0.86	
Pawhuska	95	45	70.3	1.50	
Perry	94	44	69.6	1.12	
Sac and Fox Agency	94	48	73.6	2.30	
Shawnee	94	47	70.7	5.66	
Stillwater	93	47	69.4	0.73	
Taloga	99	47	71.4	2.50	
Temple	100	45	73.7	2.16	
Ural	99	42	70.0	1.68	
Waukomis	96	48	71.3	2.90	
Weatherford	94	43	68.6	2.01	
Oregon.					
Albany *b*	.....	.....	.....	1.15	
Alpha	99	34	58.3	1.24	
Arlington	99	37	71.6	1.61	
Ashland	99	36	63.4	0.62	
Astoria	97	42	60.3	3.73	
Aurora (near)	96	39	61.2	1.83	
Bay City	98	37	56.2	6.83	
Bend	92	26	58.2	1.95	
Beulah	94	36	65.1	0.72	
Blackbutte	90	35	57.8	0.73	
Blalock	105	47	75.6	1.03	
Bullrun	92	46	60.6	4.33	
Cascade Locks	95	44	64.3	4.63	
Coquille	.....	.....	.....	1.34	
Corvallis	98	36	61.5	1.09	
Coyote	110	44	75.0	1.41	
Dayville	91	43	65.4	0.94	
Doraville	96	38	59.7	1.85	
Drain	103	39	64.6	0.34	
Ella	.....	.....	.....	0.77	
Eugene	94	40	61.6	0.89	
Fairview	100[k]	32[k]	57.1[k]	1.13	
Falls City	96	36	60.6	0.96	
Forestgrove	97	38	63.2	1.24	
Gardiner	101	42	62.3	2.31	
Glenora	98	34	58.2	4.72	
Government Camp	84	30	52.7	3.56	
Grants Pass	104	35	65.7	0.48	
Grass Valley	90	30	59.2	1.94	
Hood River (near)	99	39	64.6	1.29	
Huntington	98	50	75.2	0.48	
Jacksonville	99	37	66.0	0.75	
Joseph	92	33	60.4	1.19	
Kerby	99	32	63.4	0.43	
Klamath Falls	95	32	63.4	1.93	
Lagrande	90	41	65.0	2.77	
Lakeview	90	35	61.6	1.23	
Langlois	95	35	57.8	1.81	
Lonerock	89	31	61.0	2.45	
McKenzie Bridge	97	31	61.9	2.31	
McMinnville	98	37	62.4	1.70	
Monroe	95	39	61.4	1.18	
Mount Angel	98	42	62.2	2.32	
Nehalem	.....	.....	.....	6.29	
Newport	95	41	57.0	2.43	
Pendleton	99	37	68.8	1.35	
Pine	92	39	64.8	0.64	
Salem	98	43	62.8	1.30	
Silverlake	94	26	59.4	0.72	
Sparta	90	40	64.8	1.24	
Stafford	95	40	61.2	1.82	
The Dalles	99	42	68.4	2.11	
Toledo	102	37	59.8	1.75	
Umatilla	101	48	72.9	0.86	
Vale	93	43	67.8	0.98	
Wallowa	90	36	63.2	2.19	
Wamic	92	36	62.9	1.79	
Warm Spring	94	34	66.3	0.65	
Weston	94	36	64.6	1.55	
Williams	100	32	62.6	0.65	
Pennsylvania.					
Aleppo	84	40	64.2	5.78	
Altoona	86	38	62.6	4.34	
Athens	87	37	61.6	5.42	
Beaver Dam	.....	.....	.....	5.74	
Bellefonte	87	42	65.5	7.44	
Brookville	.....	.....	.....	5.10	
Browers	.....	.....	.....	7.19	
Butler	84	43	63.0	9.29	
California	87	42	65.8	6.70	
Cassandra	81	38	60.0	5.59	T.
Centerhall	85	42	62.5	7.59	
Clarion	.....	.....	.....	6.00	
Coatesville	88	43	65.4	5.80	
Coudersport	83	37	59.0	4.50	
Confluence	.....	.....	.....	3.74	
Davis Island Dam	.....	.....	.....	6.25	
Derry	86	39	64.2	5.04	
Doylestown	.....	.....	.....	5.42	
Dushore	83	34	60.6	5.34	
East Bloomsburg	.....	.....	.....	8.58	
East Mauch Chunk	87	40	65.0	7.99	
Easton	84	47	64.4	9.15	
Ellwood Junction	.....	.....	.....	6.28	
Emporium	84	40	61.8	5.44	

Stations.	Temperature. (Fahrenheit.)			Precipitation.	
	Maximum.	Minimum.	Mean.	Rain and melted snow.	Total depth of snow.
Pennsylvania—Cont'd.	°	°	°	*Ins.*	*Ins.*
Ephrata	88	47	65.2	5.14	
Everett	85	42	63.5	8.67	
Forks of Neshaminy	.....	.....	.....	5.93	
Franklin	88	41	62.1	7.65	
Freeport	86	42	65.3	4.80	
Gettysburg	88	48	67.0	6.47	
Girardville	.....	.....	.....	7.95	
Grampian	83	35	60.0	4.98	
Greensboro	.....	.....	.....	5.94	
Greenville	89	44	62.6	7.21	
Hamburg	86	42	65.2	4.96	
Hamlinton	83	40	60.9	9.07	
Hawthorn	87	40	62.4	5.95	
Herrs Island Dam	.....	.....	.....	4.88	
Huntingdon *a*	.....	.....	.....	5.75	
Huntingdon *b*	85	40	64.1	6.32	
Indiana	81	39	62.8	2.82	
Irwin	85	40	64.4	6.66	
Johnstown	87	41	65.5	7.69	
Keating	.....	.....	.....	6.50	
Kennett Square	81	47	64.7	8.13	
Lansdale	.....	.....	.....	5.57	
Lawrenceville	88	38	62.4	8.60	
Lebanon	89	44	65.8	6.08	
Leroy	82	42	60.6	5.13	
Lewisburg	85	42	64.8	8.02	
Lockhaven *a*	88	42	65.4	7.44	
Lockhaven *b*	.....	.....	.....	6.43	
Lock No. 4	.....	.....	.....	6.83	
Lycippus	82	43	63.5	4.55	
Marion	86	44	65.0	5.02	
Mifflin	.....	.....	.....	7.26	
Mifflintown	87	43	65.5	5.74	
Milford	87	39	61.8	11.33	
Oil City	.....	.....	.....	7.08	
Ottsville	.....	.....	.....	7.86	
Parker	.....	.....	.....	6.28	
Philadelphia	84	51	66.2	5.91	
Pocono Lake	79	39	58.2	7.03	
Point Pleasant	.....	.....	.....	8.00	
Pottsville	.....	.....	.....	7.23	
Quakertown	86	42	65.1	9.23	
Reading	85	50	66.2	6.20	
Renovo *b*	.....	.....	.....	6.07	
Saegerstown	89	40	61.0	4.85	
St. Marys	89[e]	40[e]	58.9[e]	4.90	
Saltsburg	.....	.....	.....	4.78	
Seisholtzville	.....	.....	.....	7.40	
Selinsgrove	85	45	65.6	7.57	
Shawmont	.....	.....	.....	4.89	
Smiths Corners	.....	.....	.....	7.26	
Somerset	82	36	59.6	7.25	
South Bethlehem	84	46	64.5	11.76	
South Eaton	83	42	62.2	6.74	
Springmount	.....	.....	.....	6.99	
State College	83	42	61.6	7.28	
Sunbury	.....	.....	.....	5.85	
Swarthmore	84	48	65.6	5.27	
Towanda	84	38	62.0	5.05	
Troutrun	.....	.....	.....	9.73	
Uniontown	86	48	66.6	6.03	
Warren	85	42	62.0	4.28	
Wellsboro	85	38	61.6	4.87	
Westchester	85	48	65.4	7.75	
West Newton	.....	.....	.....	6.48	
Wilkesbarre	87	46	61.8	8.38	
Williamsport	83	46	64.4	5.49	
York	90	47	68.0	6.21	
Rhode Island.					
Bristol	80	46	60.0	6.08	
Kingston	82	42	58.4	6.55	
Pawtucket	88	44	63.3	6.34	
Providence *a*	86	48	61.6	6.64	
Providence *c*	84	43	60.2	6.68	
South Carolina.					
Anderson	95	45	73.4	7.16	
Barksdale	91	47[e]	71.6[e]	9.58	
Batesburg	96	46	73.7	8.63	
Beaufort	91	59	76.8	6.89	
Bennettsville	92	52	75.0	6.99	
Blackville	93	51	75.6	7.84	
Bowman	93	53	75.5	9.64	
Calhoun Falls	.....	.....	.....	7.77	
Camden	.....	.....	.....	9.55	
Cheraw *a*	89	51	72.8	7.91	
Cheraw *b*	.....	.....	.....	7.78	
Clarks Hill	93	50	74.7	5.67	
Clemson College	94	42	71.4	4.01	
Conway	94	52	75.0	4.74	
Darlington	93	50	74.8	8.04	
Duewest	91	50	73.9	3.95	
Edisto	.....	.....	.....	12.77	
Effingham	.....	.....	.....	7.60	
Florence	95	53	75.1	5.73	
Gaffney	95	48	73.8	6.92	
Gillisonville	91	49	76.2	6.12	
Greenville	88	46	68.4	9.06	
Greenwood	93	49	74.2	4.84	

TABLE II.—*Climatological record of voluntary and other cooperating observers*—Continued.

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
South Carolina—Cont'd.	°	°	°	*Ins.*	*Ins.*
Heath Springs	94	56	73.4	10.19	
Kingstree *a*	93	54	74.8	9.55	
Kingstree *b*				9.53	
Liberty	96	45	72.8	4.93	
Little Mountain	94	49	73.8	8.61	
Longshore	95	49	74.0	9.12	
Lugoff	93[j]	50[j]	72.6[j]	9.72[j]	
Pinopolis [e]	86	59	74.5	6.83	
St. Georges	90	56	75.6	8.62	
St. Matthews	89	55	74.4	18.25	
St. Stephens				8.41	
Saluda	94[d]	50[d]	73.8[d]	8.28	
Santuck	93	46	72.0	6.97	
Scivern	95	48	74.8	11.11	
Smiths Mills				6.09	
Society Hill	90	54	74.0	8.58	
Spartanburg	92	45	71.6	9.96	
Statesburg	90	53	74.4	18.42	
Summerville	89	53	74.5	7.37	
Sumter	94	51	75.8	14.33	
Temperance	94[e]	53	74.9	6.52	
Trenton	93	59	75.4	6.12	
Trial	90	50	72.8	5.47	
Walhalla	90	44	70.5		
Walterboro	91	52	75.4	7.14	
Winnsboro	93	51	74.0	10.17	
Winthrop College	90	48	72.4	6.92	
Yemassee	91	55	76.1	10.86	
Yorkville	95	50	74.2	5.96	
South Dakota.					
Aberdeen	95	37	67.4	1.50	
Academy	92	35	65.8	2.72	
Alexandria	91	35	65.4	2.25	
Armour	94	36	66.5	2.89	
Ashcroft	95	31	63.8	2.15	
Bowdle	96	35	65.0	2.65	
Brookings	87	30	62.2	4.16	
Canton	89	32	64.7	2.38	
Cavite	94	35	67.0	2.51	
Centerville				5.23	
Chamberlain	93	41	68.0	1.45	
Cherry Creek	95	42	66.6	4.09	
Clark	98	32	66.9	4.52	
Doland	90	31	64.8	8.51	
Elkpoint	97	39	68.2	4.04	
Fairfax	90	39	65.8	2.77	
Farmingdale				2.02	
Faulkton	98	38	66.0	4.04	
Flandreau	82	34	61.4	3.00	
Forestburg	89	31	64.6	1.96	
Fort Meade	96	33	64.8	2.16	
Gannvalley	94	35	66.8	1.59	
Gettysburg	92	38	65.2	3.04	
Grand River School	94	37	65.7	4.55	
Greenwood	92	39	66.3	2.36	
Highmore				2.93	
Hitchcock				4.02	
Hotch City	93	36	64.0	2.10	
Howard	87	33	64.0	4.60	
Howell	94	35	65.7	2.84	
Kimball	89	37	64.6	1.73	
Leola	102	34	66.0	1.25	
Marion	88	36	64.3	5.12	
Mellette	93	34	65.0	3.31	
Menno	88	34	64.8	3.65	
Millbank	88	32	64.6	2.80	
Mitchell	90	36	65.7	2.38	
Oelrichs	97	38	62.6	1.00	
Pedro	95	33	65.6	2.30	
Pine Ridge	94[e]	31[e]	62.8[e]	1.41	
Plankinton	91	38	65.8	2.88	
Ramsey	86	39	62.8	5.03	
Redfield	92	31	64.6	4.17	
Rosebud	99	36	66.8	1.17	
St. Lawrence	95	36	65.3	1.90	
Silver City				6.39	
Sioux Falls	87	34	64.3	3.01	
Sisseton Agency	89	32	62.8	3.68	
Spearfish	88	33	62.2	2.28	
Tyndall	91	37	64.8	2.33	
Vermilion	93	40	66.5	3.89	
Watertown	86	31	61.9	2.26	
Waubay	87	30	61.8	4.63	
Wentworth	88	36	63.0	2.80	
Wolsey				1.66	
Tennessee.					
Andersonville	88	39	67.6	5.71	
Arlington	90	47	69.6	1.26	
Ashwood	89	41	68.4	5.02	
Benton	89	39	69.2	9.43	
Bluff City				1.84	
Bolivar	91	45	69.0	0.99	
Bristol	85	42	66.2	1.70	
Brownsville	92	50	70.9	1.43	
Byrdstown	87	38	68.2	5.03	
Carthage	89	42	69.7	6.96	
Clarksville	88	44	69.8	4.68	
Clinton				6.08	

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
Tennessee—Cont'd.	°	°	°	*Ins.*	*Ins.*
Covington	92	48	70.4	2.36	
Decatur	88	40	69.8	6.58	
Dickson	82	42	66.9	5.72	
Dover	88	41	67.4	2.24	
Dyersburg	88	48	69.6	0.58	
Elizabethton	91	44	67.7	2.45	
Erasmus	86	35	64.2	4.18	
Florence	88	42	69.6	4.65	
Franklin	87	44	69.2	4.72	
Grace [e]	94	48	71.0	6.70	
Greeneville	89	40	66.6	3.04	
Halls Hill				4.53	
Harriman	88	44	68.0	6.54	
Hohenwald	90	35	66.0	5.87	
Iron City	90	40	68.2	4.74	
Isabella	86	43	68.6	7.17	
Jackson	93	41	69.2	1.65	
Johnsonville	92	41	69.2	4.69	
Jonesboro	88	45	67.6	3.56	
Kenton	92	43	69.2	1.87	
Kingston				6.35	
Leadvale				3.78	
Lewisburg	90	41	70.1	3.58	
Liberty [e]	88	40	69.1		
Lynnville	92	42	70.2	4.41	
McKenzie [e]	90	45	70.4		
McMinnville	89	39	68.1	5.05	
Maryville	89	42	70.0	5.02	
Milan	93	43	69.4	3.11	
Newport	89	44	70.8	2.99	
Nunnelly	90	36	66.8	4.93	
Palmetto	89	43	69.6	6.08	
Pope	93	38	69.3	2.58	
Rogersville	89	41	68.0	2.48	
Rugby	89	32	65.8	2.92	
Savannah	95	48	70.5	3.86	
Sewanee	84	41	66.8	7.66	
Silverlake	81	44	63.3	5.29	
Springdale	88	39	69.2	3.73	
Springville	91	39	68.7	3.41	
Tazewell				3.07	
Tellico Plains	89	41	69.8	5.46	
Tracy City	87	39	66.6	6.57	
Trenton	94	42	69.2	3.34	
Tullahoma	90	40	69.2	5.08	
Union City	90[e]	45[e]	69.0[e]	1.32	
Waynesboro	93	39	69.0	5.63	
Wildersville	86	45	68.8	2.39	
Yukon	89	45	69.8	3.61	
Texas.					
Albany	93	52	71.6	2.87	
Alvin	96	56	77.5	5.60	
Anson				2.80	
Arthur				4.15	
Austin *a*	98	56	78.2	2.73	
Ballinger	98	50	72.5	2.91	
Beaumont	97	53	75.8	6.17	
Beeville	101	57	77.6	6.39	
Bigspring	102	50	73.4	2.93	
Blanco	94	50	71.6	4.38	
Boerne [e]	96	50	73.1	6.15	
Bonham	99	51	73.4	2.75	
Booth				2.56	
Bowie	96	45	72.1	3.30	
Brazoria	95[d]	56[d]	77.2[d]	6.27	
Brenham	93	54	76.3	5.05	
Brighton	89	59	77.0	5.43	
Brownwood	99	46	72.1	0.90	
Burnet	94	53	74.2	4.07	
Camp Eagle Pass	99	55	78.3	5.12	
Childress	98	47	72.4	2.40	
Clarksville	94	45	71.4	5.75	
Coleman	97	53	71.4	2.24	
College Station	101	53	77.4	1.81	
Colorado	100	50	74.2	2.40	
Columbia	93	55	76.7	4.07	
Comanche	95	47	72.2	3.06	
Corsicana	100	41	72.7	4.24	
Cotulla	104	56	84.8	2.50	
Cuero	100	55	78.8	2.78	
Dallas	95	48	73.3	4.94	
Danevang	97	53	77.6	2.75	
Dublin	95	50	73.2	1.70	
Duval	91	52	74.6	3.34	
Estelle	95	46	74.0	5.36	
Fort Brown	98	59	79.8	6.54	
Fort Clark	97	47	72.5	7.20	
Fort Davis	95	46	68.6	4.32	
Fort McIntosh	103	58	81.6	8.56	
Fort Ringgold	107	60	82.8	5.10	
Fort Stockton				3.63	
Fredericksburg	96	48	73.2	4.19	
Gainesville	95[e]	44[i]	71.3[e]	2.60	
Gatesville	95	49	74.3	5.71	
Georgetown	96[h]	46[h]	75.5[h]	2.85	
Grapevine	97	47	74.2	4.19	
Greenville	101	49	75.0	3.00	
Hale Center	93	51	69.1	3.58	

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
Texas—Cont'd.	°	°	°	*Ins.*	*Ins.*
Hallettsville	95	55	78.0	3.41	
Haskell	98	48	73.6	4.98	
Hearne	100	56	80.0	3.21	
Henrietta	101	42	72.8	4.69	
Hewitt				5.72	
Hillsboro	96	51	75.0	5.43	
Hondo				3.48	
Houston	99	55	78.7	3.70	
Huntsville	93	52	74.6	4.11	
Ira	102	50	72.1	2.06	
Jacksonville	94	48	73.0	4.61	
Jasper	92[e]	55[e]	73.8[e]	6.88	
Junction				4.32	
Kaufman	96	47	74.4	3.92	
Kent	100	46	71.8	4.31	
Kerrville	92	40	70.8	3.93	
Kopperl				5.06	
Lampasas	96	47	73.6	3.91	
Lapara				5.65	
Laureles Ranch				6.89	
Llano	102	58	74.6	2.50	
Longview	97	53	74.3	3.80	
Luling	95	53	75.8	3.17	
McKinney	97	44	73.9	4.91	
Mann	94	47	73.6	4.53	
Marlin	97	56	75.0	4.17	
Menardville	100	43	71.6	3.88	
Mount Blanco	95	49	68.4	2.33	
Nacogdoches	94	48	71.8	2.99	
New Braunfels	94	54	76.9	5.63	
Panter				3.49	
Paris	99	47	74.3	3.15	
Pearsall	102	55	78.7	2.81	
Port Lavaca	91	57	77.2	7.71	
Rhineland	97	45	72.3	2.65	
Rockisland	93	54	76.6	1.86	
Rockport	89	60	77.2	12.67	
Runge	100	54	79.2	2.04	
Sanderson	103	55	76.0	3.90	
San Marcos	97	51	76.6	3.90	
San Saba	98	45	73.2	4.33	
Sherman	93	51	73.1	3.09	
Sonora	100	50	71.6	4.77	
Sugarland	94	53	76.8	3.42	
Sulphur Springs	94	52	73.6	3.62	
Temple *a*	91	50	73.0	4.12	
Temple *b*	95	51	74.4	3.90	
Trinity	95	50	75.3	5.78	
Tyler	98	54	74.6	4.70	
Victoria	95[e]	51[e]	78.2[e]	4.05	
Waco	98	54	76.8	5.46	
Waxahachie	98	48	75.4		
Weatherford	97	48	73.8	5.66	
Weimar	95	54	78.3	1.75	
Wharton	94	57	78.2	1.45	
Wichita Falls				3.59	
Utah.					
Aneth	101	46	70.9	0.51	
Blackrock	94	41	64.8	0.33	
Bluecreek				T.	
Castledale	96	34	63.8	1.01	
Corinne	99	46	70.8	0.15	
Deseret	98	40	67.0	0.40	
Emery	80	39	58.7	0.85	
Escalante	96	45	66.4	1.43	
Farmington	94	45	69.2	0.10	
Fillmore	102	46	71.0	0.04	
Fort Duchesne	98	41	65.2	0.28	
Frisco	98	47	69.7	0.66	
Garrison	97	36	66.6	0.54	
Giles	104	43	69.7	0.65	
Government Creek	93	44	66.2	0.14	
Green River				0.05	
Grover	92	41	63.8	0.80	
Heber	92	36	61.8	0.25	
Henefer	89	35	61.0	0.13	
Hite	106	55	77.8	0.50	
Huntsville				0.21	
Ibapah	94	37	62.5	0.44	
Kanab	93	49	69.1	0.96	
Kelton	94	45	68.2	0.30	
La Sal	88	43	61.2	1.68	
Levan	92	44	64.8	0.48	
Loa	98	27	58.4	0.35	
Logan	86	46	67.0	0.25	
Lund	99	40	67.6	0.08	
Manti	94	42	63.6	0.28	
Marysvale	92	39	62.5	0.56	
Meadowville	83	37	59.2	1.00	
Millville				0.46	
Moab	101	48	71.3	0.70	
Monticello	88	51	63.2	1.72	
Morgan	88	36	62.2	0.09	
Mount Nebo	98	41	64.8	T.	
Mount Pleasant	95	44	65.6	0.59	
Ogden	93	50	70.6	0.00	
Park City	101	37	63.8	T.	
Parowan	93	40	64.8	0.49	

TABLE II.—*Climatological record of voluntary and other cooperating observers*—Continued.

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
Utah—Cont'd.	°	°	°	*Ins.*	*Ins.*
Pinto	89	27	59.4	0.17	
Plateau	90	32	58.4	0.47	
Provo	93	41	65.6	0.30	
Ranch	88	34	57.8	1.56	
Richfield	93	33	63.9	T.	
St. George	110	46	75.9	0.00	
Scipio	98	36	66.8	0.36	
Snowville	91	37	64.4	0.46	
Soldier Summit	90	32	60.7	0.00	
Terrace	94	46	68.8	0.35	
Thistle	96	44	68.7	0.35	
Tooele	92	49	69.0	0.19	
Tropic	90	40	63.2	0.87	
Vernal	95	43	67.6	0.89	
Wellington	97	38	66.0	0.83	
Woodruff	87	32	57.8	0.22	
Vermont.					
Burlington	80	44	64.5	4.92	
Cavendish	86	34	58.6	8.24	
Chelsea	81	38	58.8	4.85	
Cornwall	85	38	62.3	4.20	
Derby	83	40	60.7	4.00	
Enosburg Falls	84	33	61.0	4.14	
Hartland	83	32	58.2	6.26	
Jacksonville	80	31	56.6	11.65	
Manchester	83	38	59.7	5.59	
Morrisville	88	29	61.4	5.23	
Norwich	83	33	59.0	7.02	
St. Johnsbury	86	33	60.8	3.54	
Wells	86	40	61.2	4.68	
Woodstock	84	33	59.6	6.05	
Virginia.					
Alexandria	86	51	69.1	3.69	
Ashland	85	47	68.2	3.65	
Barboursville	83	49	67.2	13.20	
Bedford	91	45	70.4	8.04	
Bigstone Gap	88	44	67.3	2.22	
Blacksburg	84	43	63.9	4.62	
Bluemont	84	48	65.2	10.99	
Bonair	93	48	69.7	4.73	
Boykins				5.53	
Buckingham	90	45	68.4	3.29	
Burkes Garden	78	38	59.5	5.60	
Callaville	87	47	69.0	4.97	
Charlottesville	85	51	67.1	15.82	
Clarksville				3.31	
Columbia	90	42	66.0	4.50	
Dale Enterprise	84	41	63.6	6.45	
Danville				5.45	
Farmville	91	52	70.8	3.70	
Fredericksburg	90	47	68.0	3.82	
Grahams Forge	82[2]	43[2]	64.4[2]	4.32	
Hampton	90	50	69.6	5.49	
Hot Springs	83	42	62.0	7.78	
La Crosse	92	45	69.3	5.90	
Lexington	84	44	66.4	7.65	
Lincoln	88	44	66.2	12.27	
McDowell	82	40	61.6		
Manassas	86	53	67.4	3.13	
Mendota				4.27	
Newport News	94	57	75.2	9.67	
Petersburg	87	48	69.0	10.25	
Quantico	89	46	68.4		
Radford				3.12	
Riverton				8.54	
Roanoke	82	47	64.8	6.68	
Rockymount				7.10	
Saxe	90	44	69.0	3.10	
Shenandoah				5.25	
Speers Ferry				3.90	
Spottsville	89	42	69.0	5.73	
Stanardsville	93[1]	46	64.2[2]	7.68	
Staunton	85	45	64.6	10.71	
Stephens City	87	43	65.5	7.57	
Warsaw	88	50	68.5	6.24	
Westpoint	84	60	74.0	6.35	
Wilkerson	89	49	68.2	4.14	
Williamsburg	90	45	68.2	7.25	
Woodstock	87	46	66.4	7.21	
Wytheville	88	45	65.3	3.94	
Washington.					
Aberdeen	100	35	60.0	5.48	
Anacortes				0.62	
Ashford				5.32	
Blaine	85	42	59.8	1.84	
Bremerton	98	40	59.3	2.36	
Brinnon	86	46	61.1	1.92	
Cedonia	88	40	63.8	0.98	
Centralia	101	31	61.8	3.30	
Cheney				0.76	
Clearbrook	96	35	61.4	3.12	
Clearwater	99	34	58.2	8.74	
Cle Elum	91	35	59.4	1.06	
Colfax	91	34	63.2	1.51	
Colville	95	36	65.1	2.03	
Conconully	91	40	64.5	1.10	
Coupeville	88	42	58.8	0.73	
Crescent	92	40	64.2	1.09	

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
Washington—Cont'd.	°	°	°	*Ins.*	*Ins.*
Danville	94	40	65.4	1.98	
Dayton	93	39	67.6	1.74	
East Sound	89	38	59.2	0.87	
Ellensburg	93	37	64.4	1.28	
Ephrata	104	40	72.2	0.05	
Grandmound	98	29	60.6	3.38	
Granite Falls				3.00	
Hooper	100	38	70.0	0.40	
Horsecheaven				0.52	
Ilwaco	100[1]	38	58.3[2]	5.51	
Lacenter	96	35	61.6	4.06	
Lakeside	96	50	69.4	0.38	
Lind	103	43	72.4	0.26	
Loomis	97	49	71.2	1.23	
Mayfield	97	34	61.2	4.31	
Mottinger Ranch	102	48	72.3	0.52	
Mount Pleasant[c]	94	43	62.2	4.56	
Moxee	94	38	67.0	0.79	
Northport	97[a]	37	65.8[d]	2.06	
Odessa	100	32[d]	66.6	0.05	
Olga	79	45	58.4	0.98	
Olympia	96	33	62.0	3.10	
Pasco	108			0.02	
Pinehill	99	40	65.8	2.00	
Pomeroy	100	41	68.8	1.09	
Port Townsend	83	44	58.6	0.71	
Pullman	91	42	65.0	1.46	
Rattlesnake	89	37	64.2	0.48	
Republic	94	38	63.0	1.25	
Ritzville				0.18	
Ritzville (near)				0.26	
Rosalia	89	40	63.4	1.46	
Sedro-Woolley	93	35	61.2	2.48	
Silvana	89	39	59.4	1.26	
Snohomish	97	46	61.6	1.40	
Snoqualmie	97	40	63.4	2.98	
Southbend	94	34	58.4	5.98	
South Ellensburg	98	42	65.5	1.05	
Sprague				1.20	
Sunnyside	95	39	69.1	0.52	
Trinidad	102	45	74.8	0.00	
Twisp	94	40	65.9	1.17	
Union	97	39	60.8	3.86	
Usk	92[b]	37[b]	64.2[b]	1.95	
Vancouver	98	40	63.4	2.06	
Vashon	86	41	60.4	1.92	
Waterville	96	37	65.9	0.09	
Wenatchee (near)	94	40	66.6	0.24	
Whatcom	86	40	59.5	1.68	
Wilbur	89	30	62.4	0.50	
Zindel	101	52	74.2	2.07	
West Virginia.					
Addison	90	45	65.4	6.70	
Bayard	82	35	59.2	6.13	
Beverly	82	40	62.0	6.78	
Bluefield	80	43	65.8	3.97	
Burlington	87	37	63.5	3.86	
Byrne	88	43	66.4	4.54	
Cairo	88	40	66.5	5.37	
Central	85	41	64.5	4.22	
Chapel	95	50	72.8	2.93	
Charleston	90[d]	47[d]	70.0[d]	4.08	
Creston	90	44	67.4		
Cuba	86	43	66.0	4.90	
Dayton	88	40	62.9	4.21	
Echo	93	42	68.4	3.59	
Elkhorn	85	44	65.0	2.71	
Fairmont				5.88	
Glenville	88	44	66.2	4.52	
Grafton	85	40	64.2	4.96	
Green Sulphur Springs	86	42	65.0	3.23	
Harpers Ferry				5.08	
Hinton	86	48	66.0	3.53	
Huntington	90	45	68.4	4.66	
Josiah	87[c]	47[c]	66.4[c]	4.94	
Leonard	78	40	60.6	6.87	
Lewisburg	85	42	63.0	4.44	
Lillydale	87	42	65.0	2.01	
Logan	90	46	69.3	4.01	
Mannington	86	42	65.1	6.62	
Marlinton	89	42	62.1	4.55	
Martinsburg	87	46	65.2	5.40	
Morgantown	83	42	64.6	5.21	
Moscow	82	41	63.1	4.55	
Moundsville	85	45	65.8	3.97	
New Martinsville	89	44	67.6	4.02	
Nuttallburg	88	40	65.6	4.15	
Oldfields	89[c]	40	64.7[c]	5.32	
Parsons	85	40	63.0	10.70	
Philippi	85	39	64.8	5.03	
Pickens[c]	83	42	61.7	7.39	
Point Pleasant	89	46	68.4	3.47	
Powellton	89	45	67.9	5.24	
Princeton	81	46	63.8	4.95	
Romney	88	42	64.8	4.65	
Rowlesburg				7.63	
Ryan	87	41	65.6	2.30	
Smithfield	86	42	64.6	4.48	

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
West Virginia—Cont'd.	°	°	°	*Ins.*	*Ins.*
Southside	88	48	68.4	3.75	
Terra Alta	84	34	59.7	12.30	
Travellers Repose	83	34	58.8	5.22	
Uneeda	91	45	70.6	2.77	
Uppertract	87	40	63.6	6.02	
Valley Fork	86	44	66.1	4.21	
Wellsburg	81	45	63.4	5.73	
Weston				4.96	
Wheeling *a*				7.48	
Wheeling *b*	87	49	69.2	6.52	
Williamson	92	41	68.4	3.54	
Wisconsin.					
Antigo	90	32	61.1	1.50	
Appleton	84	35	62.4	1.24	
Ashland				0.93	
Barron	94	30	62.6	3.04	
Beloit	88	40	62.8	0.50	
Brodhead	89	35	63.8	1.28	
Butternut	85	28	58.6	1.58	
Chilton	86	34	62.6	2.55	
Chippewa Falls				0.10	
Citypoint	87	34	65.0	2.57	
Darlington	90	42	64.2	2.11	
Delavan	91	37	62.3	1.44	
Dodgeville	88	29	61.6		
Downing	90	30	61.0	1.62	
Easton	89	29	62.4	2.08	
Eau Claire	85	30	63.8	2.44	
Florence	84	27	58.5	2.12	
Fond du Lac	85	34	63.0	1.07	
Grand Rapids	85	34	62.6	1.08	
Grand River Locks				1.92	
Grantsburg	87	31	62.6	1.12	
Hancock	87	31	61.6	1.58	
Harvey	86	36	62.9	3.87	
Hayward	87	28	59.8	1.78	
Hillsboro	86	30	61.4	2.64	
Koepenick	89	26	58.4	1.80	
Lancaster	84	35	63.2	1.56	
Madison	84	40	63.6	1.39	
Manitowoc	88	35	61.6	0.92	
Meadow Valley	88	31	61.3	1.33	
Medford	92	30	63.0	0.90	
Menasha				3.32	
Neillsville	92	30	63.0	1.93	
New London	87	32	62.1	1.56	
North Crandon	90	34	63.8		
Oconto	84	34	61.7	3.80	
Osceola	88	31	62.1	2.26	
Oshkosh	87	36	63.6	1.18	
Pine River	90	31	62.5	0.92	
Portage	87	36	64.4	1.67	
Port Washington	84	35	60.2	1.73	
Prairie du Chien *a*	90	38	65.4	1.59	
Prairie du Chien *b*				1.46	
Racine	90	38	61.8	3.61	
Sheboygan	85	39	61.4	1.43	
Stevens Point	89[c]	29[b]	61.3[f]	1.88	
Valley Junction	89	34	63.2	1.84	
Viroqua	81	34	62.0	2.67	
Watertown	85	34	61.9	2.32	
Waukesha	84	40	61.9	3.30	
Waupaca	86	30	62.8	2.77	
Wausau	86	32	61.2	0.78	
Whitehall	84	30	61.7	2.43	
Wyoming.					
Afton	81	32	58.0	1.00	
Alcova	97	33	61.8	0.53	
Basin	95	40	70.2	0.62	
Bedford	76	29	54.4	1.15	
Border	83	31	56.8	1.11	
Buffalo	86	28	59.3	1.59	
Centennial	79	34	53.0	1.16	
Chugwater	87	28	57.4	1.09	
Daniel	75	30	51.6	0.77	
Embar	98	35	66.6	1.63	
Evanston	82	33	56.0	0.19	
Fontenelle[c]	82	27	56.3	1.40	
Fort Laramie	100	28	65.2	1.03	
Fort Washakie	88	37	61.8	2.00	
Fort Yellowstone	79	31	56.8	0.90	
Fourbear	78	27	55.0	1.03	
Griggs	95	28	61.3	1.32	
Hyattville	102	34	66.2		
Irma	86	32	61.2	0.81	
Iron Mountain	88	26	56.6	1.96	
Laramie	84	31	53.9	1.00	
Leo	85	26	55.2	0.97	
Lolabama Ranch	78	23	54.2	0.90	
Lusk	92	29	59.0	2.12	
Moorcroft	95	31	62.4	2.09	
Moore[d]	88	30	56.5	3.54	
Parkman	89[d]	35[d]	61.2[d]	1.80	
Pinebluff	94	33	59.4	1.34	
Rawlins	91	30	58.6	1.05	
Redbank	89	35	60.8	1.00	
Rocksprings	84	34	57.8	0.22	
South Pass	83	22	53.6	0.40	

TABLE II.—*Climatological record of voluntary and other cooperating observers*—Continued.

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
Wyoming—Cont'd.	°	°	°	*Ins.*	*Ins.*
Tensleep	90	37	64.7	0.15	
Thayne	79	26	55.2	1.53	
Thermopolis	93	38	68.3	1.66	
Porto Rico.					
Adjuntas	89	60	75.4	4.08	
Aguirre	90	71	80.6	5.85	
Arecibo	95	69	79.4	3.10	
Barros	87	61	74.8	0.03	
Bayamon	89	60	74.6	2.55	
Caguas	94	58	80.7	4.66	
Canovanas	95	74	83.0	5.04	
Cayey	98	62	80.9	4.35	
Cidra	90	54	71.5	4.15	
Coamo	93	65	77.2	1.73	
Corozal	93	65	79.4	1.82	
Fajardo	91	71	81.6	3.45	
Hacienda Coloso	92[c]	64[8]	78.6[8]	16.70	
Hacienda Josefa				8.45	
Hacienda Perla	98	70	82.8	7.47	
Humacao	91	78	84.3	7.72	
Isabela	88	68	78.9	5.74	
Juana Diaz	91	70	81.1	1.87	
La Carmelita	87	66	75.6	7.04	
La Isolina	93	65	78.2	11.65	
Lares	93	61	77.9	14.58	
Las Marias	93	67	[8]8.8	12.39	
Manati	100	68	81.6	3.40	
Maunabo	96	72	84.3	10.67	
Mayagues	93	66	80.0	12.42	
Morovis	95	62	79.9	8.80	
Ponce	91	70	81.4	2.14	
Rio Piedras				3.68	
San German	95	71	84.0	6.09	
San Lorenzo	92	67	79.2	8.68	
San Salvador	90	64	76.8	4.42	
Santa Isabel	92	71	81.0	2.17	
Utuado	94	66	80.3	7.85	
Vieques	93	70	81.1	3.13	
Yauco	90	70	81.6	1.09	
Mexico.					
Ciudad P. Diaz	95	47	73.2	4.84	
Coatzacoalcos	101	70	81.0	18.36	
Leon de Aldamas	89	50	71.0	2.99	
Vera Cruz	89	69	80.6	10.45	
New Brunswick.					
St. John	73	41	56.7	3.07	
Isthmus of Panama.					
Alhajuela	96	72	81.1	10.55	
Bohio				8.15	
Colon				10.90	
Gamboa				11.06	
La Boca	88	73	79.9	2.48	
West Indies.	°	°	°	*Ins.*	*Ins.*
Columbia, Isle of Pines	92	68	80.6	11.80	
Consuelo S. P. Macori S. D.	93	68	80.2	7.43	

Late reports for May, 1903.

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
Alaska.					
Fort Egbert	64	10	40.1	1.38	0.2
Fort Gibbon	65	13	39.4	0.16	
Fort Yukon				0.35	
Juneau	60	36	46.8	6.74	
Killisnoo	61	31	45.4	2.55	
Skagway	64	31	48.4	1.10	
Wood Island	61	33	44.0	4.92	
California.					
Claremont	86	37	60.6	0.00	
Mills College				0.00	
Le Grand	104	38	67.5	0.00	
Pilot Creek				0.92	8.0
Santa Paula	85	50	68.1	0.10	
Illinois.					
Effingham	90	28	70.3	0.68	
Iowa.					
Mount Pleasant				3.82	
Kansas.					
Gove[*1]	85	40	57.0	3.66	
Harrison	86	30	60.4	13.70	
Osage City	85	25	62.8	8.97	
Mississippi.					
Brookhaven	90	43	71.8	3.77	
Hazlehurst	91	42	71.0	6.03	
Natchez	91	44	72.1	2.85	
Port Gibson	91	42	71.4	2.77	
New Mexico.					
Cloudcroft	66	25	47.5	1.20	
Roswell	92	35[c]	63.4[c]	0.74	
South Carolina.					
Kingstree	97	52	70.8	1.35	
St. George	96	54	71.2	2.17	
St. Matthews	97	54	70.6	3.79	
Yemassee	97	54	71.2	4.50	
Texas.					
Anson				1.40	
Rockport	84	56	71.4	1.20	
Porto Rico.					
La Isolina	91	59	76.2	16.71	
Ontario.					
Peterboro				3.86	

EXPLANATION OF SIGNS.

[c] Extremes of temperature from observed readings of dry thermometer.

A numeral following the name of a station indicates the hours of observation from which the mean temperature was obtained, thus:

[1] Mean of 7 a. m. + 2 p. m. + 9 p. m. + 9 p. m. ÷ 4.
[2] Mean of 8 a. m. + 8 p. m. ÷ 2.
[3] Mean of 7 a. m. + 7 p. m. ÷ 2.
[4] Mean of 6 a. m. + 6 p. m. ÷ 2.
[5] Mean of 7 a. m. + 2 p. m. ÷ 2.

The absence of a numeral indicates that the mean temperature has been obtained from daily readings of the maximum and minimum thermometers.

An italic letter following the name of a station, as "Livingston *a*," "Livingston *b*," indicates that two or more observers, as the case may be, are reporting from the same station. A small roman letter following the name of a station, or in figure columns, indicates the number of days missing from the record; for instance "[8]" denotes 14 days missing.

No note is made of breaks in the continuity of temperature records when the same do not exceed two days. All known breaks, of whatever duration, in the precipitation record receive appropriate notice.

CORRECTIONS.

May, 1903, Arkansas, Princeton, make mean temperature 68.4 instead of 68.6. Florida, Archer, make precipitation 5.63 instead of 5.66. Minnesota, Detroit, make mean temperature 55.0 instead of 54.4. Washington, Granite Falls, make precipitation 7.85 instead of 7.88.

TABLE III.—*Resultant winds from observations at 8 a. m. and 8 p. m., daily, during the month of June, 1903.*

Stations.	Component direction from—				Resultant.	
	N.	S.	E.	W.	Direction from—	Duration.
New England.	*Hours.*	*Hours.*	*Hours.*	*Hours.*	°	*Hours.*
Eastport, Me	18	18	26	13	e.	13
Portland, Me	17	26	19	10	s. 45 e.	13
Concord, N. H	13	7	15	3	n. 63 e.	13
Northfield, Vt	14	38	10	8	s. 5 e.	24
Boston, Mass	17	20	24	13	s. 75 e.	11
Nantucket, Mass	15	24	24	8	s. 61 e.	18
Block Island, R. I	14	24	24	11	s. 52 e.	16
Narragansett, R. I.*	7	12	14	3	s. 66 e.	12
New Haven, Conn	21	21	24	8	e.	16
Middle Atlantic States.						
Albany, N. Y	16	32	14	9	s. 17 e.	17
Binghamton, N. Y.†	9	7	16	5	n. 80 e.	11
New York, N. Y	9	20	30	12	s. 43 e.	26
Harrisburg, Pa	14	16	22	18	s. 63 e.	4
Philadelphia, Pa	11	23	25	13	s. 45 e.	17
Scranton, Pa	21	21	21	15	e.	6
Atlantic City, N. J	11	23	21	17	s. 18 e.	13
Cape May, N. J	15	20	24	11	s. 65 e.	14
Baltimore, Md	16	16	24	15	e.	9
Washington, D. C	16	22	22	13	s. 56 e.	11
Cape Henry, Va.†	10	10	11	8	e.	3
Lynchburg, Va	22	16	21	20	n. 9 e.	6
Norfolk, Va	15	24	22	11	s. 51 e.	14
Richmond, Va	17	19	21	16	s. 68 e.	5
Wytheville, Va	14	11	19	29	n. 73 w.	10
South Atlantic States.						
Asheville, N. C	24	17	10	19	n. 52 w.	11
Charlotte, N. C	19	21	20	13	s. 74 e.	7
Hatteras, N. C	13	24	16	18	s. 10 w.	11
Kittyhawk, N. C.*	9	12	7	12	s. 59 w.	6
Raleigh, N. C	15	15	18	23	w.	5
Wilmington, N. C	13	19	9	32	s. 75 w.	24
Charleston, S. C	10	29	10	22	s. 32 w.	22
Columbia, S. C	13	22	16	21	s. 29 w.	10
Augusta, Ga	16	25	15	20	s. 29 w.	10
Savannah, Ga	9	30	6	26	s. 44 w.	29
Jacksonville, Fla	10	33	16	21	s. 12 w.	24
Florida Peninsula.						
Jupiter, Fla	10	27	22	14	s. 25 e.	19
Key West, Fla	8	27	24	12	s. 32 e.	22
Tampa, Fla	18	15	25	18	n. 67 e.	8
Eastern Gulf States.						
Atlanta, Ga	23	11	12	26	n. 49 w.	18
Macon, Ga.†	13	11	4	9	n. 68 w.	5
Pensacola, Fla.†	10	9	5	16	n. 85 w.	11
Mobile, Ala	16	24	7	24	s. 65 w.	19
Montgomery, Ala	23	17	12	19	n. 49 w.	9
Meridian, Miss.†	14	7	7	9	n. 16 w.	7
Vicksburg, Miss	23	16	19	18	n. 8 e.	7
New Orleans, La	13	26	15	23	s. 32 w.	15
Western Gulf States.						
Shreveport, La	25	10	24	15	n. 31 e.	18
Fort Smith, Ark	18	13	23	14	n. 61 e.	10
Little Rock, Ark	25	15	14	23	n. 42 w.	14
Corpus Christi, Tex	16	24	29	5	s. 72 e.	25
Fort Worth, Tex	21	14	16	18	n. 16 w.	7
Galveston, Tex	21	23	20	12	s. 76 e.	8
Palestine, Tex	25	19	20	12	n. 53 e.	10
San Antonio, Tex	22	18	30	6	n. 81 e.	24
Taylor, Tex †	16	8	7	3	n. 27 e.	9
Ohio Valley and Tennessee.						
Chattanooga, Tenn	17	16	9	29	n. 87 w.	20
Knoxville, Tenn	21	17	12	27	n. 75 w.	16
Memphis, Tenn	31	11	12	23	n. 29 w.	23
Nashville, Tenn	22	13	7	32	n. 70 w.	27
Lexington, Ky. †	7	9	7	9	s. 45 w.	3
Louisville, Ky	21	17	14	20	n. 56 w.	7
Evansville, Ind.†	9	10	8	7	s. 45 e.	1
Indianapolis, Ind	27	13	13	18	n. 20 w.	15
Cincinnati, Ohio	17	13	21	22	n. 14 w.	4
Columbus, Ohio	17	17	18	22	w.	4
Pittsburg, Pa	26	17	10	26	n. 61 w.	18
Parkersburg, W. Va	20	19	16	17	n. 45 w.	1
Elkins, W. Va	24	16	6	25	n. 67 w.	21
Lower Lake Region.						
Buffalo, N. Y	11	19	17	25	n. 45 w.	11
Oswego, N. Y	13	27	16	17	s. 4 w.	14
Rochester, N. Y	16	20	19	20	s. 14 w.	4
Syracuse, N. Y	12	23	17	19	s. 10 w.	11
Erie, Pa	16	17	19	19	s.	1
Cleveland, Ohio	20	19	16	19	n. 72 w.	3
Sandusky, Ohio †	8	6	9	10	n. 27 w.	2
Toledo, Ohio	18	7	21	24	n. 15 w.	11
Detroit, Mich	25	7	21	21	n.	18
Upper Lake Region.						
Alpena, Mich	22	13	23	15	n. 42 e.	12
Escanaba, Mich	35	16	9	9	n.	19
Grand Haven, Mich	24	11	14	24	n. 38 w.	16
Houghton, Mich.†	7	1	11	13	n. 18 w.	6
Marquette, Mich	32	7	11	23	n. 26 w.	28
Port Huron, Mich	31	6	19	15	n. 9 e.	25
Sault Ste. Marie, Mich	17	14	16	30	n. 78 w.	14
Chicago, Ill	30	7	24	14	n. 23 e.	25
Milwaukee, Wis	28	13	12	19	n. 25 w.	17
Green Bay, Wis	23	20	15	15	n.	3
Duluth, Minn	33	6	27	14	n. 26 e.	30

Stations.	Component direction from—				Resultant.	
	N.	S.	E.	W.	Direction from—	Duration.
North Dakota.	*Hours.*	*Hours.*	*Hours.*	*Hours.*	°	*Hours.*
Moorhead, Minn	23	20	22	11	n. 75 e.	11
Bismarck, N. Dak	21	17	23	10	n. 73 e.	14
Williston, N. Dak	22	16	21	11	n. 59 e.	12
Upper Mississippi Valley.						
Minneapolis, Minn.*	11	9	9	10	n. 27 w.	2
St. Paul, Minn	19	18	21	17	n. 76 e.	4
La Crosse, Wis. †	11	13	5	6	s. 27 w.	2
Davenport, Iowa	24	8	18	22	n. 14 w.	16
Des Moines, Iowa	22	16	17	18	n. 9 w.	6
Dubuque, Iowa	25	10	17	24	n. 25 w.	17
Keokuk, Iowa	27	8	17	21	n. 12 w.	19
Cairo, Ill	21	19	12	21	n. 77 w.	9
Springfield, Ill	21	10	16	24	n. 36 w.	14
Hannibal, Mo. †	11	9	9	11	n. 45 w.	3
St. Louis, Mo	25	15	14	19	n. 27 w.	11
Missouri Valley.						
Columbia, Mo. *	11	4	7	12	n. 36 w.	9
Kansas City, Mo	29	17	16	12	n. 18 e.	13
Springfield, Mo	31	12	17	12	n. 15 e.	20
Topeka, Kans.*	12	10	10	5	n. 68 e.	5
Lincoln, Nebr	22	23	18	12	s. 80 e.	6
Omaha, Nebr	27	20	15	11	n. 30 e.	8
Valentine, Nebr	19	23	18	12	s. 56 e.	7
Sioux City, Iowa †	13	8	11	7	n. 39 e.	6
Pierre, S. Dak	17	23	30	8	s. 75 e.	23
Huron, S. Dak	18	25	24	9	s. 65 e.	17
Yankton, S. Dak. †	8	6	13	11	n. 45 e.	3
Northern Slope.						
Havre, Mont	17	10	24	23	n. 8 e.	7
Miles City, Mont	21	16	24	14	n. 63 e.	11
Helena, Mont	16	22	7	33	s. 77 w.	27
Kalispell, Mont	10	13	13	36	s. 83 w.	23
Rapid City, S. Dak	17	16	12	24	n. 85 w.	12
Cheyenne, Wyo	29	15	13	16	n. 12 w.	14
Lander, Wyo	21	18	11	22	n. 75 w.	11
North Platte, Nebr	12	25	21	17	s. 17 e.	14
Middle Slope.						
Denver, Colo	29	15	15	10	n. 20 e.	15
Pueblo, Colo	15	12	26	18	n. 69 e.	8
Concordia, Kans	21	20	15	12	n. 72 e.	3
Dodge, Kans	21	23	20	9	s. 80 e.	11
Wichita, Kans	27	18	24	8	n. 61 e.	18
Oklahoma, Okla	23	15	21	11	n. 51 e.	13
Southern Slope.						
Abilene, Tex	20	20	27	7	e.	20
Amarillo, Tex	14	28	26	6	s. 55 e.	24
Southern Plateau.						
El Paso, Tex	21	4	27	19	n. 25 e.	19
Santa Fe, N. Mex	16	16	26	17	e.	9
Flagstaff, Ariz	7	17	10	37	s. 70 w.	29
Phoenix, Ariz	13	5	29	22	n. 41 e.	11
Yuma, Ariz	4	35	4	31	s. 41 w.	41
Independence, Cal	18	20	17	22	s. 68 w.	5
Middle Plateau.						
Carson City, Nev	14	23	2	31	s. 73 w.	30
Winnemucca, Nev	20	13	19	25	n. 41 w.	9
Modena, Utah	9	24	7	33	s. 60 w.	30
Salt Lake City, Utah	23	14	26	14	n. 53 e.	15
Grand Junction, Colo	13	23	28	14	s. 54 e.	17
Northern Plateau.						
Baker City, Oreg	24	22	10	23	n. 81 w.	13
Boise, Idaho	16	13	16	30	n. 78 w.	14
Lewiston, Idaho †	3	8	21	4	s. 74 e.	18
Pocatello, Idaho	7	19	29	16	s. 47 e.	18
Spokane, Wash	13	25	15	16	s. 5 w.	12
Walla Walla, Wash	10	28	18	11	s. 21 e.	19
North Pacific Coast Region.						
North Head, Wash	22	20	11	23	n. 81 w.	12
Port Crescent, Wash.*	0	3	3	26	s. 83 w.	23
Seattle, Wash	17	23	15	20	s. 40 w.	8
Tacoma, Wash	26	14	4	29	n. 64 w.	28
Tatoosh Island, Wash	6	28	14	25	s. 26 w.	25
Portland, Oreg	21	21	6	29	w.	23
Roseburg, Oreg	38	1	14	21	n. 11 w.	38
Middle Pacific Coast Region.						
Eureka, Cal	32	11	7	23	n. 37 w.	26
Mount Tamalpais, Cal	28	1	1	45	n. 59 w.	52
Red Bluff, Cal	26	21	22	6	n. 72 e.	16
Sacramento, Cal	8	42	14	8	s. 10 e.	34
San Francisco, Cal	0	6	1	54	s. 83 w.	53
Point Reyes Light, Cal.*	19	1	1	20	n. 47 w.	26
Southeast Farallon	36	3	1	41	n. 50 w.	52
South Pacific Coast Region.						
Fresno, Cal	38	1	2	39	n. 45 w.	52
Los Angeles, Cal	7	23	11	29	s. 48 w.	24
San Diego, Cal	15	21	4	33	s. 78 w.	30
San Luis Obispo, Cal	16	10	1	34	n. 80 w.	34
West Indies.						
Basseterre, St. Kitts, W. I.						
Bridgetown, Barbados						
Grand Turk, W. I. †.	2	10	21	2	s. 67 e.	21
Hamilton, Bermuda	10	21	10	25	s. 54 w.	19
Havana, Cuba †.	0	13	21	1	s. 57 e.	24
Puerto Principe, Cuba						
San Juan, Porto Rico	1	23	46	1	s. 64 e.	50

* From observations at 8 p. m. only. † From observations at 8 a. m. only.

TABLE IV.—*Thunderstorms and auroras, June, 1903.*

States.	No. of stations.		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	Total. No.	Total. Days.	
Alabama	52	T.	1	1	1	3	1	3	2	5	3	6	1	....	....	....	....	....	1	....	....	4	5	4	4	6	7	10	6	1	....	....	....	75	21	T.
		A.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	0	A.
Arizona	56	T.	....	....	....	7	12	8	7	4	6	8	9	5	6	3	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	75	11	T.
		A.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	0	A.
Arkansas	57	T.	....	....	....	1	2	1	1	8	5	....	....	....	....	....	....	....	2	1	9	7	10	4	1	7	8	11	....	....	....	....	....	78	16	T.
		A.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	0	A.
California	167	T.	....	....	....	....	3	3	3	9	7	3	5	....	....	1	1	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	35	9	T.
		A.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	0	A.
Colorado	81	T.	4	4	9	17	14	9	8	5	5	4	3	6	9	10	15	8	2	7	4	19	5	5	5	2	1	....	....	4	3	1	....	188	28	T.
		A.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	0	A.
Connecticut	21	T.	....	....	....	....	....	....	....	1	1	1	2	....	....	10	....	....	....	....	1	1	16	....	....	....	7	....	....	....	15	10	....	65	11	T.
		A.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	0	A.
Delaware	5	T.	....	....	....	....	....	....	1	1	....	1	1	....	....	1	....	....	....	....	....	....	1	....	....	....	....	....	....	....	....	....	....	6	6	T.
		A.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	0	A.
Dist. of Columbia	4	T.	....	....	....	....	....	....	1	....	....	1	....	....	....	....	....	1	1	....	....	1	....	....	....	....	....	....	....	1	1	....	....	7	7	T.
		A.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	0	A.
Florida	47	T.	7	11	10	5	12	10	14	12	16	8	4	4	....	....	3	3	4	6	4	5	15	5	6	9	15	12	12	10	14	14	....	250	28	T.
		A.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	0	A.
Georgia	55	T.	15	4	6	8	14	8	3	3	11	12	12	1	....	....	....	....	6	7	3	12	9	10	4	5	10	19	13	8	3	1	....	207	26	T.
		A.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	0	A.
Idaho	34	T.	12	12	2	....	1	....	2	3	3	2	8	11	8	5	6	4	3	....	....	2	1	5	....	....	....	1	1	....	....	3	....	95	21	T.
		A.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	0	A.
Illinois	92	T.	18	14	15	23	17	7	3	16	2	1	....	....	1	....	....	6	1	1	16	2	9	21	2	....	....	....	1	....	....	2	....	178	21	T.
		A.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	0	A.
Indiana	58	T.	19	16	8	14	13	22	13	5	10	1	1	....	....	....	3	10	....	....	7	2	....	10	....	....	....	1	7	4	....	....	....	166	19	T.
		A.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1	1	A.
Indian Territory	11	T.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	6	2	3	1	1	4	2	2	....	....	....	....	....	21	8	T.
		A.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	0	A.
Iowa	149	T.	3	1	10	13	2	2	11	25	2	2	....	....	....	....	....	....	2	24	14	1	8	1	....	7	12	3	....	2	24	32	....	201	22	T.
		A.	....	....	....	1	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1	1	A.
Kansas	77	T.	4	3	8	4	4	....	2	10	....	1	....	1	....	....	1	2	2	16	19	11	17	1	8	21	16	5	....	....	1	2	....	159	23	T.
		A.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	0	A.
Kentucky	41	T.	13	1	1	3	2	4	....	4	6	....	....	....	1	....	1	4	....	1	2	2	2	7	....	....	1	3	5	10	....	....	....	73	20	T.
		A.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	0	A.
Louisiana	46	T.	....	....	....	....	....	....	5	12	13	7	....	....	....	1	2	5	2	2	2	5	5	13	2	9	7	9	7	2	....	....	....	110	19	T.
		A.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	0	A.
Maine	19	T.	....	....	....	....	....	....	....	....	2	1	3	....	2	....	....	....	....	....	2	1	....	....	....	....	....	....	....	....	....	2	....	13	7	T.
		A.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	0	A.
Maryland	48	T.	....	....	....	....	....	3	11	10	1	17	10	5	....	4	....	9	15	1	2	16	1	1	....	1	2	1	1	5	6	7	....	129	22	T.
		A.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	0	A.
Massachusetts	48	T.	....	....	....	....	....	....	....	2	9	10	5	....	....	....	1	....	....	....	1	....	6	....	....	....	3	....	....	....	2	....	....	39	9	T.
		A.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	0	A.
Michigan	106	T.	2	....	....	1	1	11	12	6	7	2	....	....	1	....	1	5	....	2	5	1	....	1	1	....	....	....	1	3	6	11	....	80	20	T.
		A.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	0	A.
Minnesota	67	T.	....	....	....	1	....	1	1	1	....	1	....	....	....	....	4	....	3	11	1	1	2	1	....	....	....	....	1	5	17	25	....	76	16	T.
		A.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	0	A.
Mississippi	44	T.	2	....	....	....	....	....	4	13	6	8	1	....	....	....	....	3	1	....	1	6	11	4	....	11	9	10	2	....	....	....	....	92	16	T.
		A.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	0	A.
Missouri	95	T.	11	15	15	27	35	6	10	32	7	....	....	....	....	....	....	10	1	26	29	14	46	18	3	7	13	4	....	....	....	....	....	329	20	T.
		A.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	0	A.
Montana	40	T.	....	7	2	2	4	....	2	....	....	....	....	8	9	1	....	6	13	4	2	5	1	3	4	1	1	....	....	....	4	6	....	85	20	T.
		A.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	0	A.
Nebraska	142	T.	2	3	2	6	1	5	17	21	1	....	....	....	1	....	4	....	11	23	27	14	30	1	19	21	13	....	....	....	15	8	....	245	22	T.
		A.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	0	A.
Nevada	40	T.	4	3	....	....	2	1	3	7	9	7	3	2	2	3	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	46	12	T.
		A.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	0	A.
New Hampshire	19	T.	....	....	....	....	....	....	....	2	4	7	2	1	1	4	....	....	....	....	4	1	....	....	....	3	3	2	....	....	....	....	....	34	12	T.
		A.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1	....	....	....	....	....	....	....	....	....	....	....	....	1	1	A.
New Jersey	51	T.	....	....	....	....	....	....	4	20	1	22	10	1	4	17	....	....	....	....	8	8	5	....	....	....	....	....	....	....	8	5	....	113	13	T.
		A.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	0	A.
New Mexico	31	T.	2	....	2	7	2	....	....	3	2	2	....	....	1	3	5	3	1	2	5	4	2	....	....	....	3	....	....	....	1	....	....	50	18	T.
		A.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	0	A.
New York	99	T.	....	....	....	....	....	....	7	21	26	31	13	2	28	4	3	3	1	9	17	13	4	....	6	12	19	4	1	....	6	10	....	240	22	T.
		A.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1	....	....	1	1	A.
North Carolina	56	T.	2	1	1	5	5	14	16	4	15	16	12	2	....	....	1	2	15	9	12	21	3	20	6	15	20	17	18	1	1	....	....	254	27	T.
		A.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	0	A.
North Dakota	48	T.	....	....	....	1	4	4	....	....	2	....	....	....	2	2	....	2	2	5	1	....	....	....	....	1	....	1	....	3	1	4	....	35	15	T.
		A.	....	....	....	....	....	....	....	....	....	....	....	....	1	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1	1	A.
Ohio	128	T.	....	2	2	4	25	42	31	15	34	4	....	1	1	5	....	17	3	5	1	16	....	7	30	4	....	....	2	24	5	3	....	283	24	T.
		A.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	0	A.
Oklahoma	23	T.	1	....	1	....	....	3	....	....	....	1	....	....	....	....	2	....	....	4	8	6	7	4	6	9	3	1	....	....	....	....	....	56	14	T.
		A.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	0	A.
Oregon	74	T.	4	3	2	....	1	....	....	2	9	7	16	8	1	28	28	10	4	....	5	1	2	1	....	1	1	....	....	....	1	....	....	135	21	T.
		A.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	0	A.
Pennsylvania	91	T.	....	....	....	1	2	4	24	23	16	24	8	1	4	5	....	7	4	2	10	12	2	....	3	7	1	1	....	10	....	16	....	187	23	T.
		A.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	0	A.
Rhode Island	7	T.	....	....	....	....	....	....	....	1	....	....	....	....	....	....	....	....	....	....	....	....	6	....	....	....	....	....	....	1	4	....	....	12	4	T.
		A.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	0	A.
South Carolina	46	T.	17	14	4	10	6	13	8	5	12	11	12	1	....	....	....	....	9	15	17	11	11	15	7	4	12	16	9	6	3	....	....	248	25	T.
		A.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	0	A.
South Dakota	56	T.	1	2	1	5	3	7	4	11	2	....	....	....	....	3	2	....	3	15	13	2	7	....	14	9	5	....	....	5	21	22	....	157	22	T.
		A.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1	....	....	1	1	A.
Tennessee	56	T.	19	8	2	6	8	6	1	1	15	10	3	....	....	....	....	1	4	....	6	14	10	16	1	....	6	2	13	4	....	....	....	156	22	T.
		A.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	0	A.
Texas	95	T.	1	6	1	3	....	9	10	13	11	4	....	1	4	2	....	1	1	....	7	15	10	20	3	14	20	18	13	1	....	3	....	191	25	T.
		A.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	0	A.
Utah	47	T.	10	11	9	8	4	11	14	6	14	13	20	5	8	12	6	1	....	....	....	....	1	1	....	....	....	....	....	1	....	....	....	155	19	T.
		A.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	0	A.
Vermont	16	T.	....	....	....	....	....	....	3	1	4	8	7	2	1	....	....	....	....	....	3	....	5	....	....	....	3	....	....	....	2	1	....	40	12	T.
		A.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	0	A.
Virginia	50	T.	....	....	....	1	6	7	11	11	8	17	1	3	....	....	....	....	13	....	7	22	5	10	2	10	4	3	12	17	1	2	....	173	22	T.
		A.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	0	A.
Washington	64	T.	10	6	....	....	....	....	....	....	....	1	10	11	2	16	21	20	3	3	7	3	3	2	....	....	....	....	....	....	....	....	....	118	15	T.
		A.	....	....	1	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1	1	A.
West Virginia	43	T.	1	....	....	1	8	13	16	3	5	8	1	2	....	3	....	....	2	....	1	15	1	7	1	....	....	4	....	11	....	....	....	103	19	T.
		A.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	0	A.
Wisconsin	60	T.	2	2	....	2	1	1	5	2	3	1	1	1	....	3	7	....	....	11	5	....	....	11	....	1	....	1	....	2	5	26	....	93	21	T.
		A.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	0	A.
Wyoming	31	T.	....	3	7	6	4	5	3	....	1	....	1	3	4	7	4	6	....	3	1	9	2	8	1	....	....	....	....	....	4	7	....	89	21	T.
		A.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	0	A.
Sums	2893	T.	187	153	121	195	219	243	293	359	316	291	185	88	101	153	121	149	135	215	295	307	289	238	140	201	227	161	125	141	174	223	....	6045	....	T.
		A.	0	0	1	1	0	0	0	0	0	0	0	0	1	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	2	0	0	7	....	A.

TABLE V.—*Accumulated amounts of precipitation for each 5 minutes, for storms in which the rate of fall equaled or exceeded 0.25 in any 5 minutes, or 0.75 in 1 hour during June, 1903, at all stations furnished with self-registering gages.*

Stations.	Date.	Total duration.		Total amount of precipitation.	Excessive rate.		Amount before excessive began.	Depths of precipitation (in inches) during periods of time indicated.													
		From—	To—		Began—	Ended—		5 min.	10 min.	15 min.	20 min.	25 min.	30 min.	35 min.	40 min.	45 min.	50 min.	60 min.	80 min.	100 min.	120 min.
	1	2	3	4	5	6	7														
Albany, N. Y	30	4:03 p. m.	4:36 p. m.	0.73	4:13 p. m.	4:30 p. m.	T.	0.26	0.62	0.71	0.73	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Alpena, Mich	13–14	.....	.....	1.06	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.18	.....	.....	.....
Asheville, N. C	27	.....	.....	0.81	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.59	.....	.....	.....
Atlanta, Ga	4	D. N.	5:50 p. m.	2.32	3:25 p. m.	3:50 p. m.	1.47	0.05	0.15	0.29	0.55	0.70	.....	.....	.....	.....	.....	.....	.....	.....	.....
Atlantic City, N. J	8	.....	.....	1.17	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.42	.....	.....	.....
Augusta, Ga	11	4:40 p. m.	5:50 p. m.	0.96	4:47 p. m.	5:00 p. m.	T.	0.34	0.74	0.87	0.90	0.91	.....	.....	.....	.....	.....	.....	.....	.....	.....
Baltimore, Md	8	3:03 p. m.	3:45 p. m.	0.73	3:18 p. m.	3:35 p. m.	T.	0.32	0.54	0.70	0.73	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Binghamton, N. Y	11–12	.....	.....	2.45	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.29	.....	.....	.....
Bismarck, N. Dak	30	.....	.....	0.39	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.23	.....	.....	.....
Block Island, R. I	11–12	10:24 p. m.	10:40 a. m.	1.52	9:10 a. m.	9:45 a. m.	0.21	0.05	0.10	0.22	0.35	0.46	0.58	0.66	0.68	.....	.....	.....	.....	.....	.....
Boise, Idaho	4	.....	.....	0.20	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.14	.....	.....	.....
Boston, Mass	20–21	5:30 p. m.	11:50 p. m.	2.51	3:25 p. m.	3:50 p. m.	1.29	0.08	0.22	0.38	0.46	0.51	0.54	0.56	.....	.....	.....	.....	.....	.....	.....
Buffalo, N. Y	20	12:47 p. m.	7:15 p. m.	1.02	12:47 p. m.	1:02 p. m.	0.00	0.20	0.40	0.74	0.75	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Cairo, Ill	21	9:45 p. m.	11:30 p. m.	0.80	9:54 p. m.	10:30 p. m.	T.	0.18	0.42	0.55	0.61	0.68	0.72	0.75	0.78	.....	.....	.....	.....	.....	.....
Charleston, S. C	18	12:52 p. m.	2:08 p. m.	0.83	1:05 p. m.	1:45 p. m.	0.04	0.20	0.37	0.51	0.56	0.59	0.64	0.67	0.73	0.77	.....	.....	.....	.....	.....
Charlotte, N. C	20	5:35 p. m.	8:15 p. m.	1.13	7:23 p. m.	8:00 p. m.	0.13	0.16	0.48	0.75	0.78	0.80	0.82	0.95	0.99	.....	.....	.....	.....	.....	.....
Do	22	11:38 a. m.	12:50 p. m.	0.88	11:38 a. m.	12:15 p. m.	0.00	0.18	0.37	0.56	0.61	0.67	0.73	0.78	0.80	0.83	.....	.....	.....	.....	.....
Chattanooga, Tenn	27	1:08 p. m.	3:00 p. m.	0.59	1:32 p. m.	1:45 p. m.	0.01	0.23	0.45	0.53	0.55	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Chicago, Ill	22	.....	.....	0.68	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.17	.....	.....	.....
Cincinnati, Ohio	4–5	8:03 p. m.	D. N.	1.72	2:41 a. m.	3:05 a. m.	1.01	0.14	0.30	0.46	0.60	0.68	0.70	.....	.....	.....	.....	.....	.....	.....	.....
Cleveland, Ohio	1	.....	.....	0.88	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.40	.....	.....	.....
Columbia, Mo	18	.....	.....	0.58	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.56	.....	.....	.....
Columbia, S. C	1–2	7:02 p. m.	D. N.	3.12	7:35 p. m.	8:10 p. m.	0.05	0.09	0.21	0.34	0.53	0.76	1.18	1.48	1.53	1.58	1.64	1.68	.....	.....	.....
					11:35 p. m.	11:50 p. m.	1.92	0.09	0.58	0.88	0.92	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Do	6	3:50 a. m.	7:24 a. m.	1.95	3:55 a. m.	4:25 a. m.	T.	0.12	0.45	0.72	0.87	0.92	0.96	0.99	.....	.....	.....	.....	.....	.....	.....
		8:42 p. m.	10:36 p. m.	1.27	8:52 p. m.	9:20 p. m.	T.	0.17	0.47	0.74	1.01	1.23	1.27	.....	.....	.....	.....	.....	.....	.....	.....
Columbus, Ohio	20	.....	.....	0.84	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.70	.....	.....	.....
Corpus Christi, Tex	12–13	8:23 p. m.	11:30 a. m.	4.49	7:45 a. m.	8:25 a. m.	1.61	0.05	0.10	0.24	0.35	0.48	0.57	0.66	0.82	0.95	1.08	.....	.....	.....	.....
					8:35 a. m.	9:25 a. m.	.....	1.21	1.32	1.53	1.59	1.68	1.80	1.89	1.94	1.99	2.01	.....	.....	.....	.....
					9:25 a. m.	10:20 a. m.	.....	2.03	2.05	2.07	2.09	2.13	2.23	2.31	2.38	2.41	2.55	2.74	.....	.....	.....
Davenport, Iowa	1	.....	.....	0.87	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.42	.....	.....	.....
Denver, Colo	5	.....	.....	0.31	.....	.....	.....	.....	.....	.....	0.31	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Des Moines, Iowa	18	.....	.....	1.47	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.74	.....	.....	.....
Detroit, Mich	6	4:05 p. m.	6:10 p. m.	2.93	4:25 p. m.	5:35 p. m.	0.16	0.05	0.42	0.71	0.99	1.25	1.47	1.61	1.69	1.77	2.15	2.35	2.64	.....	.....
Dodge, Kans	20–21	.....	.....	0.83	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.55	.....	.....	.....
Dubuque, Iowa	30	.....	.....	0.68	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.30	.....	.....	.....
Duluth, Minn	27	.....	.....	0.13	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.13	.....	.....	.....	.....	.....	.....	.....
Eastport, Me	25	.....	.....	0.43	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.17	.....	.....	.....
Elkins, W. Va	27	.....	.....	0.47	.....	.....	.....	.....	.....	.....	.....	0.47	.....	.....	.....	.....	.....	.....	.....	.....	.....
Erie, Pa	7	.....	.....	0.89	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.36	.....	.....	.....
Escanaba, Mich	30	.....	.....	0.71	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.60	.....	.....	.....
Evansville, Ind	28	5:51 p. m.	7:42 p. m.	0.72	6:45 p. m.	7:05 p. m.	0.01	0.07	0.37	0.62	0.68	0.69	.....	.....	.....	.....	.....	.....	.....	.....	.....
Fort Smith, Ark	26	.....	.....	0.55	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.47	.....	.....	.....
Fort Worth, Tex	9–10	7:50 p. m.	2:00 a. m.	0.96	8:33 p. m.	8:50 p. m.	0.14	0.19	0.36	0.55	0.60	0.64	0.66	.....	.....	.....	.....	.....	.....	.....	.....
Do	20	9:40 p. m.	11:50 p. m.	0.74	10:22 p. m.	10:45 p. m.	0.03	0.07	0.26	0.40	0.56	0.61	0.65	0.68	.....	.....	.....	.....	.....	.....	.....
Do	24	10:00 p. m.	11:35 p. m.	1.38	10:25 p. m.	11:00 p. m.	0.01	0.21	0.45	0.63	0.94	1.13	1.23	1.29	1.32	.....	.....	.....	.....	.....	.....
Galveston, Tex	26	6:55 a. m.	9:05 a. m.	0.99	7:10 a. m.	7:50 a. m.	0.05	0.26	0.43	0.51	0.66	0.70	0.72	0.81	0.89	0.90	.....	.....	.....	.....	.....
Do	27	2:50 p. m.	3:45 p. m.	0.77	2:56 p. m.	3:15 p. m.	T.	0.25	0.47	0.65	0.69	0.70	0.70	0.74	.....	.....	.....	.....	.....	.....	.....
Grand Junction, Colo	12–13	.....	.....	0.72	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.54	.....	.....	.....
Green Bay, Wis	30	.....	.....	0.33	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.25	.....	.....	.....
Harrisburg, Pa	28–29	.....	.....	1.60	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.49	.....	.....	.....
Hatteras, N. C	11	3:30 a. m.	7:30 a. m.	1.15	4:12 a. m.	4:54 a. m.	0.04	0.10	0.14	0.19	0.23	0.33	0.46	0.62	0.83	0.87	.....	.....	.....	.....	.....
Huron, S. Dak	18	6:10 p. m.	7:41 p. m.	0.82	6:43 p. m.	6:54 p. m.	0.09	0.44	0.65	0.72	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Indianapolis, Ind	1–2	.....	.....	1.61	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.37	.....	.....	.....
Jacksonville, Fla	6	4:16 p. m.	5:40 p. m.	0.85	4:18 p. m.	4:35 p. m.	T.	0.17	0.53	0.75	0.77	0.79	.....	.....	.....	.....	.....	.....	.....	.....	.....
Do	18	3:33 p. m.	4:55 p. m.	1.02	3:43 p. m.	4:12 p. m.	T.	0.10	0.21	0.50	0.78	0.92	1.01	.....	.....	.....	.....	.....	.....	.....	.....
Jupiter, Fla	21	10:55 a. m.	1:45 p. m.	1.51	12:47 p. m.	1:35 p. m.	0.54	0.11	0.19	0.31	0.57	0.72	0.77	0.85	0.93	0.97	.....	.....	.....	.....	.....
Do	29	11:41 a. m.	2:30 p. m.	1.05	12:23 p. m.	12:45 p. m.	T.	0.22	0.42	0.68	0.86	0.96	0.97	1.00	.....	.....	.....	.....	.....	.....	.....
Kalispell, Mont	2–3	.....	.....	0.59	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.25	.....	.....	.....
Kansas City, Mo	21	7:16 a. m.	9:05 a. m.	0.84	7:53 a. m.	8:12 a. m.	0.02	0.16	0.48	0.74	0.80	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Key West, Fla	15	6:35 p. m.	9:40 p. m.	1.80	6:40 p. m.	7:20 p. m.	0.01	0.23	0.45	0.61	0.80	1.09	1.38	1.56	1.66	1.70	1.73	.....	.....	.....	.....
Knoxville, Tenn	6	D. N.	9:10 a. m.	0.96	6:07 a. m.	6:52 a. m.	0.03	0.10	0.23	0.42	0.45	0.57	0.65	0.69	0.72	0.78	.....	.....	.....	.....	.....
La Crosse, Wis	30	.....	.....	0.50	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.50	.....	.....	.....
Lewiston, Idaho	12	.....	.....	0.20	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.18	.....	.....	.....
Lexington, Ky	7	.....	.....	0.35	.....	.....	.....	.....	.....	0.35	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Lincoln, Nebr	21	.....	.....	0.54	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.49	.....	.....	.....
Little Rock, Ark	25	.....	.....	0.26	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.20	.....	.....	.....
Los Angeles, Cal	10	.....	.....	0.02	.....	.....	.....	.....	.....	.....	.....	.....	0.02	.....	.....	.....	.....	.....	.....	.....	.....
Louisville, Ky	1	12:24 p. m.	3:32 p. m.	1.16	12:50 p. m.	1:15 p. m.	0.21	0.27	0.39	0.59	0.68	0.73	0.74	.....	.....	.....	.....	.....	.....	.....	.....
Lynchburg, Va	6–7	.....	.....	1.24	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.39	.....	.....	.....
Macon, Ga	5	.....	.....	0.65	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.60	.....	.....	.....
Memphis, Tenn	25	3:48 p. m.	7:50 p. m.	0.95	4:05 p. m.	4:35 p. m.	0.10	0.16	0.40	0.47	0.49	0.50	0.60	.....	.....	.....	.....	.....	.....	.....	.....
Meridian, Miss	25	.....	.....	0.61	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.56	.....	.....	.....
Milwaukee, Wis	30	.....	.....	0.43	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.43	.....	.....	.....
Montgomery, Ala	21	4:28 p. m.	8:45 p. m.	2.94	5:20 p. m.	6:10 p. m.	0.14	0.19	0.34	0.43	0.48	0.58	0.63	0.70	0.88	1.18	1.52	.....	.....	.....	.....
					6:10 p. m.	6:30 p. m.	.....	1.81	1.91	2.03	2.11	2.13	.....	.....	.....	.....	.....	.....	.....	.....	.....
Nantucket, Mass	12–13	.....	.....	0.55	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.21	.....	.....	.....
Nashville, Tenn	5	5:25 a. m.	9:10 a. m.	2.55	6:30 a. m.	7:50 a. m.	0.25	0.10	0.15	0.26	0.35	0.43	0.49	0.58	0.70	0.82	1.02	1.58	2.05	.....	.....
Do	9–10	11:40 p. m.	12:45 a. m.	1.80	11:45 p. m.	12:35 a. m.	0.02	0.11	0.40	0.67	0.81	1.03	1.31	1.54	1.59	1.66	1.77	.....	.....	.....	.....
New Haven, Conn	29	.....	.....	0.89	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.62	.....	.....	.....
New Orleans, La	22	9:52 a. m.	11:50 a. m.	1.66	10:35 a. m.	11:04 a. m.	0.21	0.51	0.75	0.83	1.06	1.32	1.43	.....	.....	.....	.....	.....	.....	.....	.....
New York, N. Y	29	4:30 a. m.	11.38 a. m.	2.38	9:08 a. m.	9:58 a. m.	0.42	0.03	0.12	0.18	0.20	0.25	0.28	0.33	0.37	0.52	0.70	.....	.....	.....	.....
					9:58 a. m.	10:48 a. m.	.....	0.86	0.95	1.07	1.08	1.13	1.17	1.23	1.28	1.57	1.68	.....	.....	.....	.....
					10:48 a. m.	11:10 a. m.	.....	1.73	1.78	1.85	1.90	1.94	.....	.....	.....	.....	.....	.....	.....	.....	.....
Norfolk, Va	7	.....	.....	0.62	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.54	.....	.....	.....
Northfield, Vt	11	.....	.....	0.89	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.67	.....	.....	.....
North Head, Wash	15–16	.....	.....	0.77	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.35	.....	.....	.....
Oklahoma, Okla	24	4:21 a. m.	7:50 a. m.	0.93	4:45 a. m.	5:20 a. m.	0.01	0.08	0.14	0.36	0.47	0.65	0.75	0.80	0.83	.....	.....	.....	.....	.....	.....
Omaha, Nebr. *	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Palestine, Tex	21	3:00 a. m.	6:50 a. m.	1.00	3:20 a. m.	4:00 a. m.	0.05	0.11	0.19	0.29	0.45	0.58	0.66	0.71	0.75	0.79	.....	.....	.....	.....	.....
Parkersburg, W. Va	22	.....	.....	1.18	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.65	.....	.....	.....
Pensacola, Fla	4	.....	.....	0.62	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.53	.....	.....	.....
Philadelphia, Pa	10	10:57 a. m.	12:55 p. m.	2.05	11:00 a. m.	12:15 p. m.	0.02	0.10	0.23	0.38	0.47	0.54	0.70	0.97	1.28	1.47	1.60	1.78	2.00	.....	.....
Pittsburg, Pa	22–23	.....	.....	1.46	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.52	.....	.....	.....
Pocatello, Idaho	2–3	.....	.....	0.63	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.29	.....	.....	.....
Portland, Me	12–13	.....	.....	1.96	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.60	.....	.....	.....
Portland, Oreg	27	.....	.....	0.98	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.18	.....	.....	.....
Pueblo, Colo	9–10	.....	.....	1.39	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.28	.....	.....	.....
Raleigh, N. C	22	2:45 p. m.	7:00 p. m.	2.26	3:05 p. m.	4:15 p. m.	0.04	0.09	0.25	0.35	0.49	0.56	0.59	0.61	0.65	0.91	1.16	1.56	1.87	.....	.....
Richmond, Va	11	3:27 p. m.	8:50 p. m.	1.01	3:35 p. m.	4:15 p. m.	0.04	0.06	0.15	0.26	0.34	0.46	0.61	0.68	0.72	0.75	0.78	0.81	.....	.....	.....
Rochester, N. Y	29	.....	.....	0.83	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.43	.....	.....	.....

TABLE V.—*Accumulated amounts of precipitation for each 5 minutes, etc.*—Continued.

Stations.	Date.	Total duration. From—	Total duration. To—	Total amount of precipitation.	Excessive rate. Began—	Excessive rate. Ended—	Amount before excessive began.	Depths of precipitation (in inches) during periods of time indicated. 5 min.	10 min.	15 min.	20 min.	25 min.	30 min.	35 min.	40 min.	45 min.	50 min.	60 min.	80 min.	100 min.	120 min.
	1	2	3	4	5	6	7														
Sacramento, Cal	29			T.																	
St. Louis, Mo	1	3:28 p. m.	7:35 p. m.	0.96	3:34 p. m.	4:00 p. m.	T.	0.26	0.40	0.60	0.68	0.74	0.76	.....	.....	.....	.....	.....	.....	.....	.....
Do	22	9:05 a. m.	10:55 a. m.	0.93	9:31 a. m.	10:30 a. m.	0.02	0.04	0.04	0.18	0.45	0.64	0.69	0.71	0.74	0.79	0.82	0.91	.....	.....	.....
St. Paul, Minn	30			0.49														0.31	.....	.....	.....
Salt Lake City, Utah	9			0.53													0.53	.....	.....	.....	.....
San Antonio, Tex	25–26	11:25 p. m.	4:00 a. m.	1.12	3:17 a. m.	3:42 a. m.	0.02	0.33	0.64	0.83	0.99	1.09	1.10	.....	.....	.....	.....	.....	.....	.....	.....
San Diego, Cal	28			T.																	
Sandusky, Ohio	1			1.11														0.52	.....	.....	.....
San Francisco, Cal	11			T.																	
Savannah, Ga	4	8:54 a. m.	1.35 p. m.	0.77	8:57 a. m.	9:15 a. m.	T.	0.14	0.40	0.60	0.67	0.68	.....	.....	.....	.....	.....	.....	.....	.....	.....
Do	8	2:20 p. m.	4:25 p. m.	1.10	2:32 p. m.	2:55 p. m.	0.03	0.13	0.25	0.42	0.67	0.73	.....	.....	.....	.....	.....	.....	.....	.....	.....
Do	11	8:28 p. m.	11:20 p. m.	0.99	8:28 p. m.	9:00 p. m.	0.00	0.12	0.28	0.50	0.62	0.66	0.76	0.81	0.83	.....	.....	.....	.....	.....	.....
Do	18	6:10 p. m.	8:45 p. m.	0.69	6:10 p. m.	6:45 p. m.	0.00	0.15	0.35	0.41	0.44	0.48	0.60	0.64	0.67	.....	.....	.....	.....	.....	.....
Scranton, Pa	11–12			3.04														0.36	.....	.....	.....
Seattle, Wash	24			0.29														0.15	.....	.....	.....
Shreveport, La	8			0.45														0.42	.....	.....	.....
Spokane, Wash	1–2			0.67														0.53	.....	.....	.....
Springfield, Ill	21			0.90														0.59	.....	.....	.....
Springfield, Mo	2–3			1.06														0.41	.....	.....	.....
Tampa, Fla	7	5:50 p. m.	8:15 p. m.	2.02	5:54 p. m.	6:45 p. m.	T.	0.21	0.51	0.59	0.64	0.67	0.83	1.36	1.70	1.79	1.86	1.90	.....	.....	.....
Do	8–9	11:15 p. m.	12:40 a. m.	0.70	11:33 p. m.	11:55 p. m.	T.	0.07	0.27	0.42	0.55	0.58	0.62	.....	.....	.....	.....	.....	.....	.....	.....
Taylor, Tex	22			0.31														0.29	.....	.....	.....
Toledo, Ohio	6	3:20 p. m.	10:00 p. m.	1.20	3:30 p. m.	3:45 p. m.	0.12	0.38	0.54	0.62	0.65	0.66	.....	.....	.....	.....	.....	.....	.....	.....	.....
Topeka, Kan	24–25	11:25 p. m.	3:15 p. m.	2.52	12:02 a. m.	12:45 a. m.	0.06	0.24	0.59	0.92	1.17	1.38	1.52	1.64	1.74	1.80	1.81	.....	.....	.....	.....
Valentine, Nebr	23	5:30 p. m.	6:05 p. m.	0.46	5:37 p. m.	5:50 p. m.	T.	0.10	0.35	0.42	0.45	0.46	.....	.....	.....	.....	.....	.....	.....	.....	.....
Vicksburg, Miss	24	3:08 p. m.	4:50 p. m.	0.89	3:14 p. m.	3:32 p. m.	T.	0.44	0.67	0.79	0.84	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Washington, D. C	21	8:30 p. m.	10:00 p. m.	0.89	9:00 p. m.	9:40 p. m.	0.07	0.08	0.23	0.30	0.46	0.60	0.67	0.73	0.81	.....	.....	.....	.....	.....	.....
Wichita, Kans	21			0.44														0.43	.....	.....	.....
Wilmington, N. C	7	3:20 a. m.	9:05 a. m.	3.78	§ 7:15 a. m.	8:05 a. m.	0.91	0.07	0.17	0.34	0.43	0.54	0.68	0.80	1.02	1.20	1.48	.....	.....	.....	.....
					‖ 8:05 a. m.	8:45 a. m.	.....	1.75	1.89	2.10	2.19	2.30	2.52	2.70	2.83	2.86	.....	.....	.....	.....	.....
Do	25	1:57 p. m.	2:33 p. m.	1.68	2:00 p. m.	2:25 p. m.	T.	0.26	0.61	0.88	1.21	1.28	1.31	.....	.....	.....	.....	.....	.....	.....	.....
Wytheville, Va	27	5:29 p. m.	11:10 p. m.	1.60	6:35 p. m.	7:10 p. m.	0.01	0.12	0.33	0.49	0.77	1.07	1.17	1.22	1.25	.....	.....	.....	.....	.....	.....
Yankton, S. Dak	19			0.67														*	.....	.....	.....
Bridgetown, Barbados	29–30	6:25 p. m.	4:45 a. m.	4.03	§ 8:26 p. m.	8:55 p. m.	0.67	0.17	0.30	0.36	0.73	0.93	1.08	.....	.....	.....	.....	.....	.....	.....	.....
					‖ 11:10 p. m.	11:30 p. m.	1.98	0.11	0.34	0.73	0.82	0.83	.....	.....	.....	.....	.....	.....	.....	.....	.....
Havana, Cuba	16	11:50 a. m.	12:19 p. m.	0.61	11:52 a. m.	12:17 p. m.	T.	0.07	0.12	0.25	0.49	0.60	.....	.....	.....	.....	.....	.....	.....	.....	.....
Do	16	12:57 p. m.	2:20 p. m.	1.50	1:05 p. m.	1:55 p. m.	0.04	0.08	0.13	0.17	0.33	0.58	0.89	1.12	1.28	1.38	1.45	.....	.....	.....	.....
San Juan, Porto Rico	8	8:33 p. m.	9:20 p. m.	0.56	8:33 p. m.	8:55 p. m.	0.00	0.14	0.35	0.48	0.53	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....

*Self-register not working.

TABLE VI.—*Data furnished by the Canadian Meteorological Service, June, 1903.*

Stations.	Pressure, in inches. Actual, reduced to mean of 24 hours.	Pressure, in inches. Sea level, reduced to mean of 24 hours.	Pressure, in inches. Departure from normal.	Temperature. Mean.	Temperature. Departure from normal.	Temperature. Mean maximum.	Temperature. Mean minimum.	Precipitation. Total.	Precipitation. Departure from normal.	Precipitation. Depth of snow.
	Ins.	*Ins.*	*Ins.*	°	°	°	°	*Ins.*	*Ins.*	*Ins.*
St. Johns, N. F	29.87	30.01	+.10	44.4	— 7.2	51.5	37.2	1.84	—1.76	.....
Sydney, C. B. I	30.06	30.10	+.15	50.2	— 5.2	59.6	40.8	1.38	—1.85	.....
Halifax, N. S	29.95	30.06	+.11	53.6	— 4.1	61.6	45.5	3.49	—0.27	.....
Grand Manan, N. B	29.93	29.98	+.05	54.0	— 2.2	60.1	47.9	2.01	—0.93	.....
Yarmouth, N. S	29.94	30.01	+.06	55.3	+ 0.3	62.7	47.9	6.68	+3.92	.....
Charlottetown, P. E. I	30.01	30.05	+.13	55.6	— 1.8	64.9	46.4	2.24	—0.43	.....
Chatham, N. B	29.99	30.01	+.12	57.2	— 2.8	67.7	46.7	2.52	—0.94	.....
Father Point, Que	29.96	29.98	+.11	49.4	— 3.6	56.2	42.5	2.29	—0.69	.....
Quebec, Que	29.65	29.97	+.05	59.3	— 1.9	67.6	51.1	3.51	—0.14	.....
Montreal, Que	29.73	29.93	—.01	63.3	— 1.6	71.7	55.0	4.76	+1.23	.....
Bissett, Ont	29.34	29.94	.00	59.6	— 2.0	73.1	46.1	3.98	+0.82	.....
Ottawa, Ont	29.60	29.92	—.02	62.8	— 2.5	73.1	52.6	6.55	+3.63	.....
Kingston, Ont	29.60	29.91	—.06	61.6	— 1.8	69.7	53.5	6.16	+3.73	.....
Toronto, Ont	29.54	29.91	—.06	61.8	— 1.6	71.1	52.5	3.25	+0.45	.....
White River, Ont	28.70	30.00	+.06	55.7	— 3.0	71.6	39.8	1.63	—0.59	.....
Port Stanley, Ont	29.30	29.94	—.03	60.6	— 3.2	69.7	51.5	3.42	+0.69	.....
Saugeen, Ont	29.24	29.94	—.03	57.4	— 3.0	66.4	48.4	2.03	—0.32	.....
Parry Sound, Ont	29.24	29.92	—.04	60.1	— 1.6	70.3	49.8	2.57	+0.15	.....
Port Arthur, Ont	29.30	30.01	+.07	56.9	+ 0.5	67.2	46.6	1.60	—1.13	.....
Winnipeg, Man	29.18	30.01	+.12	61.5	— 0.7	75.4	47.6	0.49	—2.80	.....
Minnedosa, Man	28.23	30.02	+.13	60.5	+ 0.9	73.1	47.8	1.03	—1.97	.....
Qu'Appelle, Assin	27.75	29.98	+.11	59.7	— 0.2	72.9	46.4	1.46	—1.96	.....
Medicine Hat, Assin	27.69	29.93	+.08	64.0	+ 2.0	78.2	49.8	T.	—2.76	.....
Swift Current, Assin	27.45	29.99	+.12	61.7	+ 1.7	74.8	48.7	2.26	—0.41	.....
Calgary, Alberta	26.44	29.92	+.08	57.9	+ 1.7	71.9	43.9	2.05	—0.40	.....
Banff, Alberta	25.41	29.93	+.09	56.0	+ 4.5	70.3	41.7	1.90	—1.43	.....
Edmonton, Alberta	27.66	29.92	+.08	60.3	+ 3.4	73.2	47.4	4.94	+2.08	.....
Prince Albert, Sask	28.41	29.95	+.08	59.8	+ 2.1	73.1	46.4	1.07	—1.44	.....
Battleford, Sask	28.26	29.98	+.12	61.8	+ 2.3	75.0	48.5	2.00	—1.31	.....
Kamloops, B. C	28.67	29.86	—.01	68.6	+ 4.8	81.7	55.5	0.61	—0.81	.....
Victoria, B. C	29.92	30.01	.00	59.0	+ 2.7	66.6	51.4	0.67	—0.53	.....
Barkerville, B. C	25.72	29.99	+.12	54.9	+ 4.2	68.3	41.5	3.58	+0.10	.....
Hamilton, Bermuda	29.89	30.05	—.07	73.0	— 2.0	78.2	67.8	3.83	—2.12	.....
Dawson City, Yukon	28.69	.....	.....	58.8	.....	71.5	46.1	0.50	.....	.....

TABLE VII.—*Heights of rivers referred to zeros of gages, June, 1903.*

Stations.	Distance to mouth of river.	Danger line on gage.	Highest water. Height.	Highest water. Date.	Lowest water. Height.	Lowest water. Date.	Mean stage.	Monthly range.
Mississippi River.	*Miles.*	*Feet.*	*Feet.*		*Feet.*		*Feet.*	*Feet.*
St. Paul, Minn	1,954	14	11.9	3, 4	3.4	30	6.6	8.5
Red Wing, Minn	1,914	14	10.3	1	3.0	28–30	6.3	7.3
Reeds Landing, Minn	1,884	12	9.7	1	2.8	30	5.8	6.9
La Crosse, Wis	1,819	12	11.9	1, 2	4.1	30	8.0	7.8
Prairie du Chien, Wis	1,759	18	14.6	4, 5	4.0	30	10.0	10.6
Dubuque, Iowa	1,699	15	15.6	5–7	5.1	30	11.3	10.5
Leclaire, Iowa	1,609	10	10.2	4–8	3.8	30	7.7	6.4
Davenport, Iowa	1,593	15	13.2	4–7	4.7	30	9.9	8.5
Muscatine, Iowa	1,562	16	14.6	5, 6	6.2	30	11.5	8.4
Galland, Iowa	1,472	8	10.6	6	3.4	30	7.1	7.2
Keokuk, Iowa	1,463	15	19.5	5	6.1	30	13.6	13.4
Hannibal, Mo	1,402	13	22.5	8	8.4	30	16.4	14.1
Mississippi River—Cont'd.	*Miles.*	*Feet.*	*Feet.*		*Feet.*		*Feet.*	*Feet.*
Grafton, Ill	1,306	23	28.4	11	12.6	30	21.8	15.8
St. Louis, Mo	1,264	30	38.0	10	21.0	30	30.8	17.0
Chester, Ill	1,189	30	33.3	13, 14	17.9	30	26.8	15.4
New Madrid, Mo	1,003	34	34.5	14–16	21.4	30	29.2	13.1
Memphis, Tenn	843	33	33.0	18–20	18.6	1	27.7	14.4
Helena, Ark	767	42	42.9	21, 22	25.7	1	37.1	17.2
Arkansas City, Ark	635	42	45.6	22–25	32.9	1	42.0	12.7
Greenville, Miss	595	42	39.8	23–25	27.0	1	35.8	12.8
Vicksburg, Miss	474	45	43.1	24–28	31.4	1	39.3	11.7
New Orleans, La	108	16	15.1	22, 27–29	12.0	1	14.1	3.1
Yellowstone River.								
Glendive, Mont	98	17	9.0	20	3.0	1	7.0	6.0

TABLE VII.—*Heights of rivers referred to zeros of gages*—Continued.

Stations.	Distance to mouth of river.	Danger line on gage.	Highest water.		Lowest water.		Mean stage.	Monthly range.
			Height.	Date.	Height.	Date.		
James River.	*Miles.*	*Feet.*	*Feet.*		*Feet.*		*Feet.*	*Feet.*
Lamoure, N. Dak.	.....	25	—0.1	20–30	—0.5	1–6	—0.3	0.4
Huron, S. Dak	210	9	2.8	1	0.9	29	1.8	1.9
Missouri River.								
Townsend, Mont.	2,504	10	7.9	8–10	4.9	30	6.9	3.0
Fort Benton, Mont.	2,285	12	6.3	9,10	3.8	30	5.3	2.5
Bismarck, N. Dak.	1,309	14	8.7	23–25	4.1	4	7.2	4.6
Pierre, S. Dak.	1,114	14	9.2	25	5.2	7,8	7.4	4.0
Sioux City, Iowa	784	19	12.5	28	8.7	12,13	10.7	3.8
Omaha, Nebr.	669	18	14.4	1	9.8	14	11.5	4.6
Plattsmouth, Nebr.	641	17	11.2	1	5.8	14	7.8	5.4
St. Joseph, Mo.	481	10	15.0	2	6.8	15	9.8	8.2
Kansas City, Mo.	388	21	35.0	1,2	14.6	16	20.9	20.4
Glasgow, Mo.	231	.....	26.3	5	10.4	18	15.9	15.9
Boonville, Mo.	199	20	30.9	6	14.2	27	19.7	16.7
Hermann, Mo.	103	24	29.5	6	14.0	19	19.8	15.5
Chippewa River.								
Chippewa Falls, Wis.	90	16	8.0	1,2	—1.0	28	2.8	9.0
Illinois River.								
Peoria, Ill.	135	14	13.0	9–11	9.9	30	11.7	3.1
Youghiogheny River.								
Confluence, Pa.	59	10	5.0	30	0.8	5,6	2.2	4.2
West Newton, Pa.	15	23	7.3	30	0.6	7	2.3	6.7
Allegheny River.								
Warren, Pa.	177	14	2.5	25	0.2	13	0.9	2.3
Oil City, Pa	123	13	4.8	24	0.7	5–10	1.6	4.1
Parker, Pa.	73	20	6.5	24	0.8	6–8	1.9	5.7
Freeport, Pa	29	20	11.8	24	1.5	5	3.9	10.3
Clarion River.								
Clarion, Pa.	32	10	5.0	23,24	0.2	5,6,8	1.4	4.8
Monongahela River.								
Weston, W. Va.	161	18	3.0	10	0.2	19,20	1.4	2.8
Fairmont, W. Va.	119	25	8.0	8	1.5	5	3.2	6.5
Greensboro, Pa.	81	18	12.0	30	7.5	7	9.1	4.5
Lock No. 4, Pa.	40	28	14.5	30	6.7	7	9.4	7.8
Conemaugh River.								
Johnstown, Pa.	64	7	6.0	23	1.5	6,7	2.5	4.5
Red Bank Creek.								
Brookville, Pa.	35	8	1.6	24	—0.4	11–13	0.5	2.0
Beaver River.								
Ellwood Junction, Pa.	10	14	4.5	30	2.4	6–9	3.0	2.1
Great Kanawha, River.								
Charleston, W. Va.	58	30	8.2	8	4.6	15,16	7.0	3.6
Little Kanawha River.								
Glenville, W. Va.	103	20	4.7	7	—1.0	19,20	1.5	5.7
New River.								
Radford, Va.	155	14	4.2	29	—0.1	3–6,9	0.6	4.3
Hinton, W. Va.	95	14	4.4	29	1.8	21–23	2.5	2.6
Cheat River.								
Rowlesburg, W. Va.	36	14	6.0	13,29	2.0	6,11	3.8	4.0
Ohio River.								
Pittsburg, Pa.	966	22	9.9	24	4.6	18,28	6.3	5.3
Davis Island Dam, Pa.	960	25	10.6	25	3.0	7	6.0	7.6
Beaver Dam, Pa	925	27	15.3	25	3.7	7	7.6	11.6
Wheeling, W. Va.	875	36	14.7	25	3.4	9	7.1	11.3
Parkersburg, W. Va.	785	36	13.4	26	5.6	7	8.0	7.8
Point Pleasant, W. Va.	705	39	13.4	27	4.6	6	7.9	8.8
Huntington, W. Va.	660	50	16.6	27	8.1	6	11.5	8.5
Catlettsburg, Ky.	651	50	15.9	28	6.5	6	10.4	9.4
Portsmouth, Ohio	612	50	16.7	29	9.0	18	11.9	7.7
Cincinnati, Ohio.	499	50	17.7	30	10.3	19	13.5	7.4
Madison, Ind	413	46	15.9	7	9.8	20,26	12.5	6.1
Louisville, Ky.	367	28	8.3	2,7	5.6	21	6.9	2.7
Evansville, Ind.	184	35	18.4	9	8.1	23,24	12.1	10.3
Paducah, Ky.	47	40	29.4	11,12	11.3	30	21.9	18.1
Cairo, Ill.	1,073	45	43.4	13	25.0	30	35.8	18.4
Muskingum River.								
Zanesville, Ohio	70	20	7.1	26	6.0	5–7,19,20	6.3	1.1
Scioto River.								
Columbus, Ohio.	110	17	9.0	8	2.8	1–4	4.2	6.2
Miami River.								
Dayton, Ohio	77	18	4.7	7	1.4	29,30	2.3	3.3
Wabash River.								
Mount Carmel, Ill.	50	15	10.6	11,12	3.0	30	6.0	7.6
Licking River.								
Falmouth, Ky.	30	25	3.0	7,8	0.6	28	1.9	2.4
Kentucky River.								
High Bridge, Ky.	117	17	12.5	9	9.1	22,23,26,27	9.9	3.4
Frankfort, Ky.	65	31	8.6	9	5.9	22–30	6.5	2.7
Clinch River.								
Speers Ferry, Va.	156	20	0.6	5,23	—0.5	30	0.2	1.1
Clinton, Tenn.	52	25	7.5	7	3.9	18	5.1	3.6
Holston River.								
Rogersville, Tenn.	103	14	2.3	8	1.6	27	2.0	0.7
French Broad River.								
Asheville, N. C.	144	6	4.4	7	0.6	25	1.8	3.8
Leadvale, Tenn.	70	15	5.0	7	0.3	22,29	1.6	4.7
Tennessee River.								
Knoxville, Tenn.	635	29	6.2	8	1.7	27	3.1	4.5
Kingston, Tenn.	556	25	7.4	7	2.2	27	3.9	5.2
Chattanooga, Tenn.	452	33	11.6	3	4.1	26,27	6.8	7.5
Bridgeport, Ala.	402	24	9.4	4	2.5	27	5.1	6.9
Florence, Ala.	255	16	10.0	5,6	2.5	23,25,28–30	5.4	7.5
Riverton, Ala.	225	25	15.3	6	2.9	29,30	7.5	12.4
Johnsonville, Tenn.	95	24	18.7	7	4.4	30	9.3	14.3
Cumberland River.								
Burnside, Ky.	516	50	10.1	4	1.6	26	4.0	8.5
Carthage, Tenn.	305	40	17.0	7	2.0	27,28	6.8	15.0
Nashville, Tenn.	189	40	27.4	5	3.6	26	10.8	23.8
Clarksville, Tenn.	126	42	38.0	6	5.9	26,27	15.6	32.1
Arkansas River.								
Wichita, Kans.	832	10	7.6	2	1.8	14	4.4	5.8
Arkansas River.—Cont'd.								
Webbers Falls, Ind. T.	465	23	20.3	1,3	5.6	26	11.3	14.7
Fort Smith, Ark.	403	22	24.0	1	6.3	21,22	12.7	17.7
Dardanelle, Ark.	256	21	23.2	1	7.0	23,25,26	13.4	16.2
Little Rock, Ark.	176	23	24.8	3	8.6	28	15.7	16.2
White River.								
Newport, Ark.	150	26	25.6	6,7	6.0	30	15.2	19.6
Yazoo River.								
Yazoo City, Miss.	80	25	17.1	27–30	6.5	2	13.6	10.6
Red River.								
Arthur City, Tex.	638	27	12.0	1	8.0	22–24,30	9.8	4.0
Fulton, Ark.	515	28	20.1	3	8.7	25	13.0	11.4
Shreveport, La.	327	29	11.7	6	2.8	28,29	6.6	8.9
Alexandria, La.	118	33	15.5	1	5.7	30	10.5	9.8
Ouachita River.								
Camden, Ark.	304	39	20.7	3	6.3	26	10.2	14.4
Monroe, La.	122	40	28.6	1	10.7	29,30	19.9	17.9
Atchafalaya River.								
Melville, La.	100	31	32.0	26–30	30.7	2	31.5	1.3
Susquehanna River.								
Binghamton, N. Y.	306	16	6.2	13	2.6	7,9,11	3.6	3.6
Towanda, Pa.	262	16	6.5	26	0.4	4–11	2.1	6.1
Wilkesbarre, Pa	183	17	11.0	26	2.9	4–8.11	5.3	8.1
Harrisburg, Pa	69	17	7.2	27	0.9	5–8	3.3	6.3
West Branch Susquehanna.								
Lockhaven, Pa	65	12	2.6	26	— 1.4	7	0.4	4.0
Williamsport, Pa	39	20	9.5	26	0.5	2	3.0	9.0
Juniata River.								
Huntingdon, Pa.	90	24	6.0	24,30	3.2	6,7	4.1	2.8
Shenandoah River.								
Riverton, Va	58	22	10.0	10	0.4	27,28	2.0	9.6
Potomac River.								
Cumberland, Md.	290	8	5.6	29	2.8	3–5	3.4	2.8
Harpers Ferry, W. Va.	172	18	12.8	30	2.5	23,24	5.1	10.3
James River.								
Lynchburg, Va	260	18	8.4	7	1.0	19–24	2.4	7.4
Richmond, Va.	111	12	14.7	8	— 0.4	4,5	1.9	15.1
Dan River.								
Danville, Va	55	8	5.2	27	0.2	18,19	1.4	5.0
Roanoke River.								
Clarksville, Va	196	12	8.0	28	3.5	22,23,26	5.0	4.5
Weldon, N. C.	129	30	25.4	9	10.2	20	13.8	15.2
Cape Fear River.								
Fayetteville, N. C.	112	38	14.0	24	3.7	19	7.1	10.3
Edisto River.								
Edisto, S. C.	75	6	5.3	6,7	3.3	1,2	4.5	2.6
Pedee River.								
Cheraw, S. C.	149	27	21.2	9	3.1	18	6.8	18.1
Black River.								
Kingstree, S. C.	52	12	11.8	16	0.8	3–7	7.0	11.0
Lynch Creek.								
Effingham, S. C.	35	12	13.9	13	3.9	3	7.3	10.0
Santee River.								
St. Stephens, S. C.	97	12	15.0	15	6.5	1	9.5	8.5
Congaree River.								
Columbia, S. C.	37	15	27.2	9	2.3	1	6.6	24.9
Wateree River.								
Camden, S. C.	45	24	28.3	8	9.0	1	14.4	19.3
Waccamaw River.								
Conway, S. C.	40	7	3.2	27	1.8	8	2.8	1.4
Savannah River.								
Calhoun Falls, S. C.	347	15	15.3	7	3.0	20,23–26	4.3	12.3
Augusta, Ga.	268	32	27.3	8	9.2	26	13.4	18.1
Broad River.								
Carlton, Ga.	30	11	8.0	7	2.7	25,26	4.0	5.3
Flint River.								
Albany, Ga.	80	20	12.9	9	3.1	23	6.5	9.8
Chattahoochee River.								
Oakdale, Ga.	305	18	20.0	6	3.4	19,20	6.5	16.6
Westpoint, Ga.	239	20	12.0	7	3.5	25	5.6	8.5
Ocmulgee River.								
Macon, Ga.	125	18	19.0	5	4.0	26	7.1	15.0
Abbeville, Ga.	50	11	14.8	12	4.7	22	8.4	10.1
Oconee River.								
Dublin, Ga	79	20	13.1	11	2.0	26	5.4	11.1
Coosa River.								
Rome, Ga.	271	30	17.1	6	2.2	23–26	5.3	14.9
Gadsden, Ga.	144	18	14.7	8	1.8	27	5.8	12.9
Alabama River.								
Montgomery, Ala.	265	35	15.3	10	4.3	21	8.6	11.0
Selma, Ala	212	35	17.0	9–11	5.9	21,22	10.3	11.1
Tombigbee River.								
Columbus, Miss.[1]	303	33	3.1	1	— 2.0	22,23	0.5	5.1
Demopolis, Ala.[1]	155	35	13.0	9	2.2	22	8.0	10.8
Black Warrior River.								
Tuscaloosa, Ala.	90	43	16.8	7	6.2	20,21	9.5	10.6
Brazos River.								
Kopperl, Tex	369	21	6.0	16	0.2	4	1.5	5.8
Waco, Tex.	301	24	7.0	16	3.0	5,6	4.6	4.0
Booth, Tex	76	39	6.7	22	4.7	1,8,9	5.5	2.0
Red River of the North.								
Moorhead, Minn	418	26	8.4	1,2	7.8	30	8.1	0.6
Columbia River.								
Umatilla, Oreg.	270	25	25.1	18	15.5	1	22.7	9.6
The Dalles, Oreg.	166	40	43.1	18	24.0	1	38.3	19.1
Willamette River.								
Albany, Oreg	118	20	4.7	2	2.4	27	3.3	2.3
Portland, Oreg.	12	15	24.0	18,19	13.2	1	21.2	10.8
Sacramento River.								
Red Bluff, Cal.	265	23	1.6	1	0.4	24–30	0.8	1.2
Sacramento, Cal.	64	29	17.9	1–3	11.7	30	14.7	6.2

(1) 29 days only.

HAWAIIAN CLIMATOLOGICAL DATA.

By Mr. CURTIS J. LYONS, Territorial Meteorologist.

Meteorological Observations at Honolulu, June, 1903.

Date.	Pressure at sea level.	Temperature.		During twenty-four hours preceding 1 p. m. Greenwich time, or 1:30 a. m. Honolulu time.									Total rainfall at 9 a. m., local time.
				Temperature.		Means.		Wind.		Average cloudiness.	Sea-level pressures.		
		Dry bulb.	Wet bulb.	Maximum.	Minimum.	Dew-point.	Relative humidity.	Prevailing direction.	Force.		Maximum.	Minimum.	
	*	†	†			‡	‡		§				
1	30.09	71	67	75	69	65.3	79	ne.	4	10	30.15	30.06	0.22
2	30.04	71	68	75	70	65.5	80	ne.	5	8	30.12	30.03	0.35
3	29.98	71	69	78	70	65.5	77	ne.	3-1	5-3	30.09	30.00	0.40
4	29.94	70	68	81	69	66.7	80	ne.	1-0	3-8	30.03	29.95	0.04
5	29.92	68	66	81	68	66.3	77	sw.	1-0	4	29.97	29.90	0.06
6	29.95	71	67.5	82	66	66.3	81	sw.	1-0	3-10	30.01	29.93	0.00
7	29.99	72	66	82	67	64.5	70	ne.	2	4-2	30.04	29.96	0.03
8	29.99	73	67.5	80	67	63.3	69	ene.	4	3	30.03	29.96	0.00
9	30.01	72	69.5	80	71	64.0	70	ene.	5	2	30.04	29.96	0.02
10	29.99	75	68.5	83	71	67.3	74	ne.	1	3	30.06	29.97	0.00
11	29.97	73	67.5	82	73	63.5	66	ne.	3	2	30.06	29.98	0.01
12	29.98	70	68	81	71	65.5	76	ne.	3	4-5	30.07	29.99	0.07
13	30.00	72	67	80	68	65.0	78	ne.	2	9-3	30.06	29.96	0.23
14	29.98	73	67.5	81	70	63.5	65	ne.	3-1	4	30.05	29.96	0.02
15	29.96	73	66	81	70	63.7	70	ne.	3-1	8-4	30.03	29.94	0.08
16	29.92	70	65.5	83	67	63.0	65	ne.	2	2	30.00	29.95	0.01
17	29.99	70	65.5	84	65	64.7	72	ne.	1-0	3-1	29.97	29.88	0.00
18	29.94	73	67	85	65	64.5	69	ne.	1-0	4-2	29.99	29.90	0.00
19	29.97	68	65.5	84	66	63.7	69	ne.	1-0	3-1	30.00	29.90	0.00
20	29.97	75	68.5	84	66	65.7	75	ne.	2-0	2	30.04	29.89	0.00
21	30.00	77	70.5	84	70	66.0	68	ne.	3-0	4-2	30.03	29.94	0.00
22	29.99	74	68	85	73	67.0	68	ne.	2-0	2-1	30.05	29.96	0.00
23	29.99	74	67.5	84	72	65.0	66	ne.	3-0	4-0	30.05	29.97	0.01
24	29.97	74	66.5	83	71	64.0	66	nne-ne.	4-1	1-5	30.01	29.94	0.00
25	30.00	75	68	83	72	63.0	63	ne.	4-2	2-6	30.04	39.95	0.02
26	29.98	77	69	84	71	64.5	66	ne.	3	4	30.03	29.95	0.00
27	30.02	76	68	85	70	65.5	66	ne.	3-4	4	30.05	26.97	0.00
28	29.97	77	68	83	74	63.7	64	ne.	5	8-3	30.07	29.96	0.00
29	29.96	77	68	83	75	63.5	61	ne.	3-5	4-6	30.03	29.95	0.00
30	30.00	76	69	83	75	67.0	65	ne.	4	4	30.05	29.97	0.00
31													
Sums..													1.57
Means.	29.982	72.9	67.6	82.0	69.7	64.9	70.5	.....	2.3	4.0	30.041	29.954	.....
Departure..	—.022	.....	.....	.....	.....	—0.1	—0.5	.....	.....	.....	.....	.....	.....

Mean temperature for the month of June, 1903, $(6+2+9)\div 3=76.0°$; normal is 76.0°.
Mean pressure for the month of June, 1903, $(9+3)\div 2=29.989$; normal is 30.011.

* This pressure is as recorded at 1 p. m., Greenwich time. † These temperatures are observed at 6 a. m., local, or 4.31 p. m., Greenwich time. ‡ These values are the means of $(6+9+2+9)\div 4$. § Beaufort scale.

Maximum thermometer set at 9 p. m. and minimum at 2 p. m., local time.

GENERAL SUMMARY FOR JUNE, 1903.

Honolulu.—Temperature mean for the month, 76.0°; normal, 76.0°; average daily maximum, 82.0°; average daily minimum, 69.7°; mean daily range, 12.3°; greatest daily range, 20°; least daily range, 5°; highest temperature, 85°; lowest, 65°.

Barometer average, 29.989; normal, 30.011; highest, 30.15; lowest, 29.88; greatest 24-hour change, .08; lows passed Honolulu, 16th; highs, 1st, 2d, and 27th.

Relative humidity average, 70.5 per cent; normal, 71.0 per cent; mean dew-point, 64.9°; normal, 65°; mean absolute moisture, 6.74 grains per cubic foot; normal, 6.83 grains.

Rainfall, 1.57 inches; normal, 1.52 inches; rain record days, 15; normal, 19; greatest rainfall in one day, 0.40, on the 2d; total at Luakaha, 13.49; normal, 8.63; at Kapiolani Park, 0.39; normal, 0.36.

The artesian well water level fell during the month from 34.65 feet above mean sea level to 34.18; June 30, 1902, it stood at 33.50. The average daily mean sea level for the month was 9.78 feet, the assumed annual mean being 10.00 feet above datum. For June, 1902, it was 9.76.

Trade wind days, 28, (two of ENE.); normal, 26; average force of wind during daylight, Beaufort scale, 2.3. Average cloudiness, tenths of sky, 4.0; normal, 4.0.

Approximate percentages of district rainfall as compared with normal: Hilo, 60 per cent; Hamakua, 23; Kohala, 34; Waimea, 40; Kona, 38; Kau, 142; Puna, 73; Maui, 135; Oahu, 110; Kauai, 135. The heaviest 24-hour rainfalls for the month were at Nahiku, 3.18 on the 4th; Luakaha, 3.07, 3d, and Mountain View, Olaa, 2.54, on the 9th. The heaviest monthly rainfall, Nahiku, 15.70.

Mean temperature table for June, 1903.

Stations.	Elevation.	Mean max.	Mean min.	Cor. av'ge.
	Feet.	°	°	°
Pepeekeo	100	78.7	69.2	73.3
Hilo	40	85.1	67.2	75.9
Kohala	521	80.4	67.2	73.1
Waimea	2,730	74.0	60.0	66.3
Volcano house	4,000	72.0	52.8	61.7
Naalehu	650	81.0	67.0	73.3
United States Experimental Station	350	82.4	69.5	75.2
W. R. Castle	50	82.6	71.1	76.1

Errata.—The heaviest monthy rainfall for May was given as being at Mountain View, Olaa, 11.70 inches; a delayed report from Nahiku, Maui, gives the amount at that place 14.89 inches, which was the heaviest for May.

Kohala, dew point average, 65.5°; humidity, 75.0. Naalehu humidity average 73.6; barometer average, 29.41; highest, 29.49; lowest, 29.35; greatest, 24-hour change, .07; trade wind days, 26

Naalehu reports light earthquake on the 9th, at 7:20 p. m.

Heavy gale at Waimea, Hawaii, on the 27th.

Pepeekeo reports a fine glow in the mornings and afternoons on several occasions during the month.

Kohala reports the lowest June rain record (1.01) with one exception (1897) in twenty years.

Rainfall data for June, 1903.

Stations.	Elevation.	Amount.
HAWAII.		
HILO, e. and ne.	*Feet.*	*Inches.*
Waiakea	50	4.9
Hilo (town)	100	4.89
Kaumana	1,250	7.11
Pepeekeo	100	3.17
Hakalau	200	3.37
Honohina	300	2.52
Puuohua	1,050	4.18
Laupahoehoe	500	1.75
Ookala	400	0.33
HAMAKUA, ne.		
Kukaiau	250	0.55
Paauilo	300	0.27
Paauhau	900	0.25
Honokaa (Mill)	425	0.34
Honokaa (Meinicke)	1,100	0.16
Kukuihaele	700	1.35
KOHALA, n.		
Niulii	200	1.07
Kohala (Mission)	521	1.01
Kohala (Sugar Co.)	270	.....
Hawi, Mill	700	0.88
Puakea Ranch	600	0.56
Puuhue Ranch	1,847	0.71
Waimea	2,720	0.88
KONA, w.		
Holualoa	1,350	3.46
Kaukahoku Leheula	3,500	1.35
Kainaliu	1,470	1.32
Kealakekua	1,580	2.29
Napoopoo	25	1.20
Hoopuloa	1,650	3.78
Hoopuloa	2,500	4.43
Huehue	2,000	1.70
KAU, se.		
Kahuku Ranch	1,680	1.60
Honuapo	15	0.70
Naalehu	650	0.99
Hilea	310	0.80
Pahala	850	.....
Moaula	1,700	.....
Volcano House	4,000	3.45
PUNA, e.		
Olaa, Mountain View (Russel)	1,690	7.25
Olaa (Plantation)	.....	.....
Kapoho	110	2.17
Pahoa	600	5.70
MAUI.		
Lahaina	40	.....
Waiopae Ranch	700	.....
Kaupo (Mokulau), s	285	3.95
Kipahulu, s	308	4.55
Nahiku, ne	850	12.21
Nahiku	1,600	15.70
Haiku, n	700	3.74
Kula (Waiakoa), n	2,700	2.58
Kula (Erehwon), n	4,000	.....
Puuomalei, n	1,400	3.30
MAUI—Cont'd.		
Haleakala Ranch	2,000	1.80
Wailuku, ne	250	0.92
OAHU.		
Punahou (W. R.), sw	47	1.57
Kulaokahua (Castle), sw	50	1.27
Makiki Reservoir	120	1.66
U. S. Naval Station, sw	6	1.65
Kapiolani Park, sw	10	0.39
College Hills	175	2.16
Manoa (Woodlawn Dairy), c	285	5.97
Manoa (Rhodes Gardens)	360	9.97
School street (Bishop), sw	.....	.....
Insane Asylum, sw	30	1.94
Kamehameha School	.....	.....
Kalihi-Uka, sw	485	7.55
Nuuanu (W. W. Hall), sw	50	1.34
Nuuanu (Wyllie street)	250	3.01
Nuuanu (Elec. Station), sw	405	.....
Nuuanu (Luakaha), e	850	13.49
U. S. Experiment Station	350	2.17
Laniakea (Nahuina)	1,150	6.72
Tantalus Heights	1,360	8.64
Waimanalo, ne	25	1.56
Maunawili, ne	300	6.91
Kaneohe	100	2.92
Ahuimanu, ne	350	3.59
Kahuku, n	25	0.66
Waialua	37	.....
Wahiawa	900	1.99
Ewa Plantation, s	60	.....
U. S. Magnetic Station	45	.....
Waipahu	200	2.20
Moanalua	15	1.15
Pacific Heights	700	2.57
KAUAI.		
Lihue (Grove Farm), e	200	3.84
Lihue (Molokoa), e	300	3.66
Lihue (Kukaua), e	1,000	9.25
Kealia, e	15	.....
Kilauea, ne	325	2.11
Hanalei, n	10	3.87
Waioli	15	.....
Haena	15	.....
Waiawa	32	0.18
Eleele	.....	.....
Wahiawa (Mountain)	.....	.....
McBryde (Residence)	850	2.85
Lawai (Gov. Road)	450	5.14
Lawai, w	225	2.15
Lawai, e	800	4.86
Koloa	100	2.31
Delayed May reports.		
Nuuanu (Wyllie Street)	.....	3.26
Puuhue Ranch	.....	1.77
Honokaa (1,100)	.....	1.28
Nahiku	1,600	14.89

NOTE.—The letters n, s, e, w, and c show the exposure of the station relative to the winds.

CLIMATOLOGY OF COSTA RICA.

Communicated by Mr. H. PITTIER, Director, Physico-Geographic Institute.

TABLE 1.—*Hourly observations at the Observatory, San José de Costa Rica, during June, 1903.*

Hours.	Pressure.		Temperature.		Relative humidity.		Rainfall.		
	Observed, 1903.	Normal, 1889–1900.	Observed, 1903.	Normal, 1889–1900.	Observed, 1903.	Normal, 1889–1900.	Observed, 1903.	Normal, 1889–1900.	Duration, 1903.
	Inches.	*Inches.*	° *F.*	° *F.*	%	%	*Ins.*	*Ins.*	*Hrs.*
1 a. m	26.15	26.13	64.0	64.0	94	93	0.09	0.08	1.66
2 a. m	26.14	26.12	63.7	63.7	93	93	0.27	0.07	2.83
3 a. m	26.13	26.11	63.3	63.3	92	93	0.09	0.06	2.00
4 a. m	26.12	26.10	62.8	62.9	92	93	0.08	0.05	2.00
5 a. m	26.12	26.10	62.3	62.8	93	93	0.03	0.04	2.00
6 a. m	26.16	26.11	62.1	62.4	93	93	0.01	0.04	1.50
7 a. m	26.17	26.12	62.2	62.8	91	90	0.00	0.02	0.00
8 a. m	26.15	26.13	66.2	67.1	79	84	0.00	0.02	0.00
9 a. m	26.16	26.14	70.2	70.2	72	78	0.00	0.04	0.00
10 a. m	26.16	26.15	73.9	73.4	68	70	0.02	0.08	0.17
11 a. m	26.15	26.14	75.0	75.7	65	67	0.00	0.04	0.00
Noon	26.15	26.13	76.6	77.0	63	68	0.28	0.17	0.50
1 p. m	26.13	26.12	77.4	77.1	65	68	0.24	0.40	0.99
2 p. m	26.12	26.10	76.1	76.1	68	71	0.34	1.06	3.01
3 p. m	26.11	26.09	74.1	73.8	75	76	1.88	1.13	6.51
4 p. m	26.10	26.08	72.4	71.4	81	81	1.55	2.09	8.51
5 p. m	26.10	26.09	70.6	69.5	83	85	1.33	1.63	5.93
6 p. m	26.11	26.10	68.5	68.2	88	88	1.79	1.91	10.29
7 p. m	26.13	26.11	67.3	67.1	93	89	1.36	0.97	10.34
8 p. m	26.14	26.13	66.4	66.3	94	92	1.63	0.74	9.50
9 p. m	26.15	26.14	65.9	65.8	91	92	0.65	0.40	6.50
10 p. m	26.16	26.15	65.5	65.3	94	93	0.89	0.16	6.42
11 p. m	26.17	26.15	65.0	64.9	95	93	0.86	0.13	3.84
Midnight	26.17	26.15	64.6	64.4	94	93	0.02	0.09	1.00
Mean	26.14	26.12	68.2	68.2	84	85	.....	.....	.....
Minimum	26.04	26.01	59.5	55.8	47	.....	.....	.....	.....
Maximum	26.24	26.22	84.2	85.1	100	.....	.....	.....	.....
Total	.....	.....	.....	.....	.....	.....	13.41	11.42	85.50

REMARKS.—At San José the barometer is 1169 meters above sea level. Readings are corrected for gravity, temperature, and instrumental error. The hourly readings for pressure, and wet and dry bulb thermometers, are obtained by means of Richard registering instruments, checked by direct observations every three hours from 7 a. m. to 10 p. m. The thermometers are 1.5 meters above ground and are corrected for instrumental errors. The total hourly rainfall is as given by Hottinger's self-register, checked once a day. Under maximum, the greatest hourly rainfall for the month is given. The standard rain gage is 1.5 meters above ground. Since January 1, 1902, observations at San José have been made on seventy-fifth meridian time, which is 0 hours, 36 minutes, 13.3 seconds *in advance* of San José local time. The normals for pressure, temperature, and relative humidity have been adjusted to this time; the normal for rainfall in Table 1 and the sunshine observations and normal in Table 2 refer to local time. At Port Limon the hours of direct observation are 8 a. m., 2 and 8 p. m., San José local time; the barometer is 3.4 meters above sea level. The means for temperature and relative humidity in Table 4 are obtained from two-hourly readings given by a Richard self-registering thermometer.

TABLE 2.—*San José, June, 1903.*

Time.	Sunshine.		Cloudiness.		Temperature of the soil at depth of—				
	Observed, 1903.	Normal, 1889–1900.	Observed, 1903.	Normal, 1889–1900.	6 inches.	12 inches.	24 inches.	48 inches.	120 inches.
	Hours.	*Hours.*	%	%	° *F.*	° *F.*	° *F.*	° *F.*	° *F.*
7 a. m	14.59	9.79	62	59	70.7	71.4	72.5	72.0	71.5
8 a. m	21.33	17.25	.....	.....	.....	.....	.....	.....	.....
9 a. m	23.96	19.58	.....	.....	.....	.....	.....	.....	.....
10 a. m	24.86	19.30	69	66	71.1	71.4	72.6	72.1	.....
11 a. m	20.30	17.75	.....	.....	.....	.....	.....	.....	.....
Noon	15.44	14.09	.....	.....	.....	.....	.....	.....	.....
1 p. m	15.18	11.58	86	84	71.8	71.8	72.5	72.1	.....
2 p. m	11.90	10.52	.....	.....	.....	.....	.....	.....	.....
3 p. m	7.81	7.01	.....	.....	.....	.....	.....	.....	.....
4 p. m	5.82	4.35	94	94	72.1	72.0	72.5	72.0	.....
5 p. m	3.11	1.67	.....	.....	.....	.....	.....	.....	.....
6 p. m	0.81	0.39	.....	.....	.....	.....	.....	.....	.....
7 p. m	.....	.....	93	92	72.0	72.0	72.5	71.9	.....
8 p. m	.....	.....	.....	.....	.....	.....	.....	.....	.....
9 p. m	.....	.....	.....	.....	.....	.....	.....	.....	.....
10 p. m	.....	.....	82	81	71.8	72.0	72.5	71.9	.....
11 p. m	.....	.....	.....	.....	.....	.....	.....	.....	.....
Midnight	.....	.....	.....	.....	.....	.....	.....	.....	.....
Mean	.....	.....	80	79	71.6	71.8	72.5	72.0	71.5
Total	165.11	133.28	.....	.....	.....	.....	.....	.....	.....

TABLE 3.—*Rainfall at stations in Costa Rica, June, 1903.*

Stations.	Height above sea level.	Observed, 1903.		Averages.		
		Amount.	Number of days.	Number of years.	Amount.	Number of days.
	Feet.	*Inches.*			*Inches.*	
Sipurio (Talamanca)	197	9.85	22	2	8.50	18
Boca Banano	10	7.68	13	7	5.98	15
Port Limon	10	2.68	8	6	7.17	14
Swamp Mouth	10	6.22	12	3	4.06	9
Zent	66	5.91	15	2	2.60	17
Siquirres	197	0.75	6	4	11.50	19
Dos Novillos	400	8.03	16	.....	.....	.....
Guapiles	984	13.82	8	2	10.75	18
Cariblanco (Sarapiqui)	2,740	20.74	27	4	20.79	20
San Carlos	528	17.60	25	4	12.01	21
Las Lomas	873	15.43	13	12	10.63	12
Peralta	1,089	12.32	20	4	13.31	20
Turrialba	2,034	10.51	17	7	11.77	16
Juan Viñas	3,412	4.65	18	5	8.03	17
Santiago	3,609	9.96	22	2	7.48	18
Paraiso	4,383	29.13	18	1	9.80	18
Cachi	3,346	11.65	20	1	8.74	23
Las Concavas	4,386	12.13	25	1	8.82	12
Cartago	4,761	12.40	24	7	5.79	17
Tres Rios	4,265	9.37	19	13	11.26	18
San Francisco Guadalupe	3,894	12.87	22	7	11.58	22
San Jose	3,806	13.41	25	14	11.10	22
La Verbena	3,740	12.13	24	5	12.56	22
Nuestro Amo	2,595	10.75	22	6	10.08	18
Alajuela	3,117	13.43	22	2	11.22	17
San Isidro Alajuela	4,416	21.73	27	2	14.06	24
Las Cañas	90	12.20	22	.....	.....	.....

TABLE 4.—*Observations taken at Port Limon and Zent, June, 1903.*

Stations.	Pressure.			Temperature.			Relative humidity.
	Minimum.	Maximum.	Mean.	Minimum.	Maximum.	Mean.	
	Inches.	*Inches.*	*Inches.*	° *F.*	° *F.*	° *F.*	%
Port Limon	29.55	29.98	29.82	64.4	86.5	76.4	80
Zent	.....	.....	.....	66.2	91.0	79.0	85

Stations.	Cloudiness.	Sunshine.	Rainfall.		Temperature of soil at depth of—		
			Amount.	Number of days.	6 inches.	12 inches.	24 inches.
	%	*Hours.*	*Inches.*		° *F.*	° *F.*	° *F.*
Port Limon	.....	.....	2.68	8	.....	.....	.....
Zent	68	187.63	5.91	15	82.5	82.2	81.5

MEXICAN CLIMATOLOGICAL DATA.

By Señor MANUEL E. PASTRANA, Director of the Central Meteorologic-Magnetic Observatory.

June, 1903.

Stations.	Altitude.	Mean barometer.*	Temperature.			Relative humidity.	Precipitation.	Prevailing direction.	
			Max.	Min.	Mean.			Wind.	Cloud.
	Feet.	*Inches.*	° *F.*	° *F.*	° *F.*	%	*Ins.*		
Chihuahua	4,684	25.15	95.0	48.2	75.2	44	3.34	ne.	.....
Guadalajara (Obs. del. Est.)	5,186	24.87	93.2	60.8	74.5	61	6.95	nw.	.....
Guanajuato	6,640	.....	.....	.....	.....	.....	.....	.....	.....
Leon (Guanajuato)	5,906	24.23	89.4	55.4	71.8	56	3.00	ese.	.....
Mazatlan	25	29.81	86.5	70.2	79.7	78	3.38	nw.	.....
Merida	50	.....	.....	.....	.....	.....	.....	.....	.....
Mexico (Obs. Cent.)	7,472	23.03	80.6	50.9	62.4	67	7.59	n.	ne.
Mexico (E. N. Agric.)	7,442	.....	.....	.....	.....	.....	.....	.....	.....
Monterey (Seminario)	1,626	.....	.....	.....	.....	.....	.....	.....	.....
Morelia (Seminario)	6,401	23.90	81.5	52.9	65.7	77	3.81	s.	.....
Pachuca	7,959	.....	.....	.....	.....	.....	.....	.....	.....
Puebla (Col. Cath.)	7,108	.....	.....	.....	.....	.....	.....	.....	.....
Puebla (Col. d Est.)	7,118	23.31	80.2	46.8	62.8	72	6.74	n.	.....
Queretario	6,070	.....	.....	.....	.....	.....	.....	.....	.....
Toluca	8,812	.....	.....	.....	.....	.....	.....	.....	.....
Zacatecas	8,015	22.51	82.8	42.3	63.5	58	1.57	e.	.....
Zapotlan	5,078	25.01	88.3	57.0	71.4	66	2.87	sse.	.....

*The monthly barometric means are reduced to the international standard of gravity.

Chart I. Tracks of Centers of High Areas, June, 1903.

Chart I. Tracks of Centers of High Areas. June, 1903.

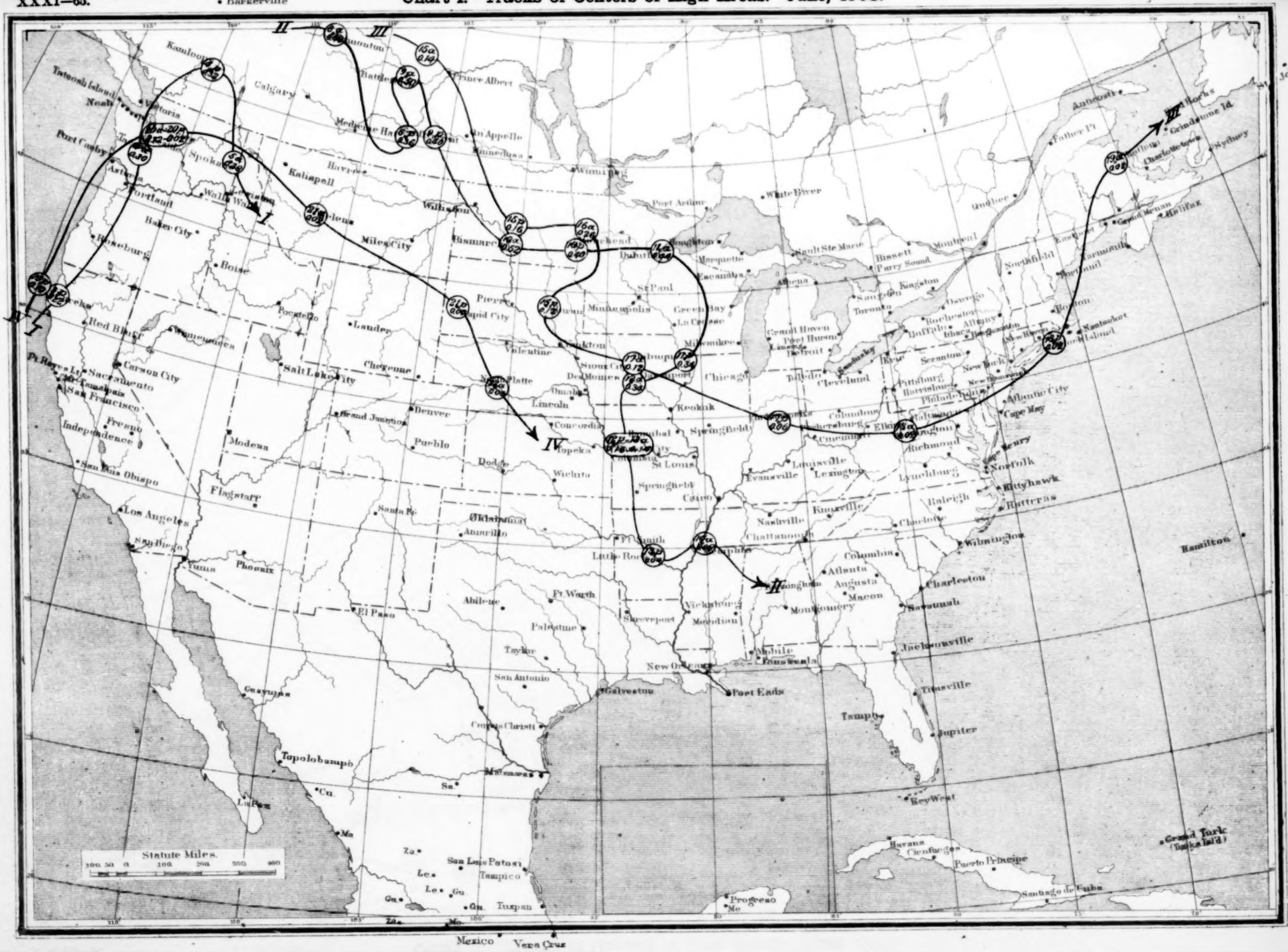


Chart II. Tracks of Centers of Low Areas. June, 1903.

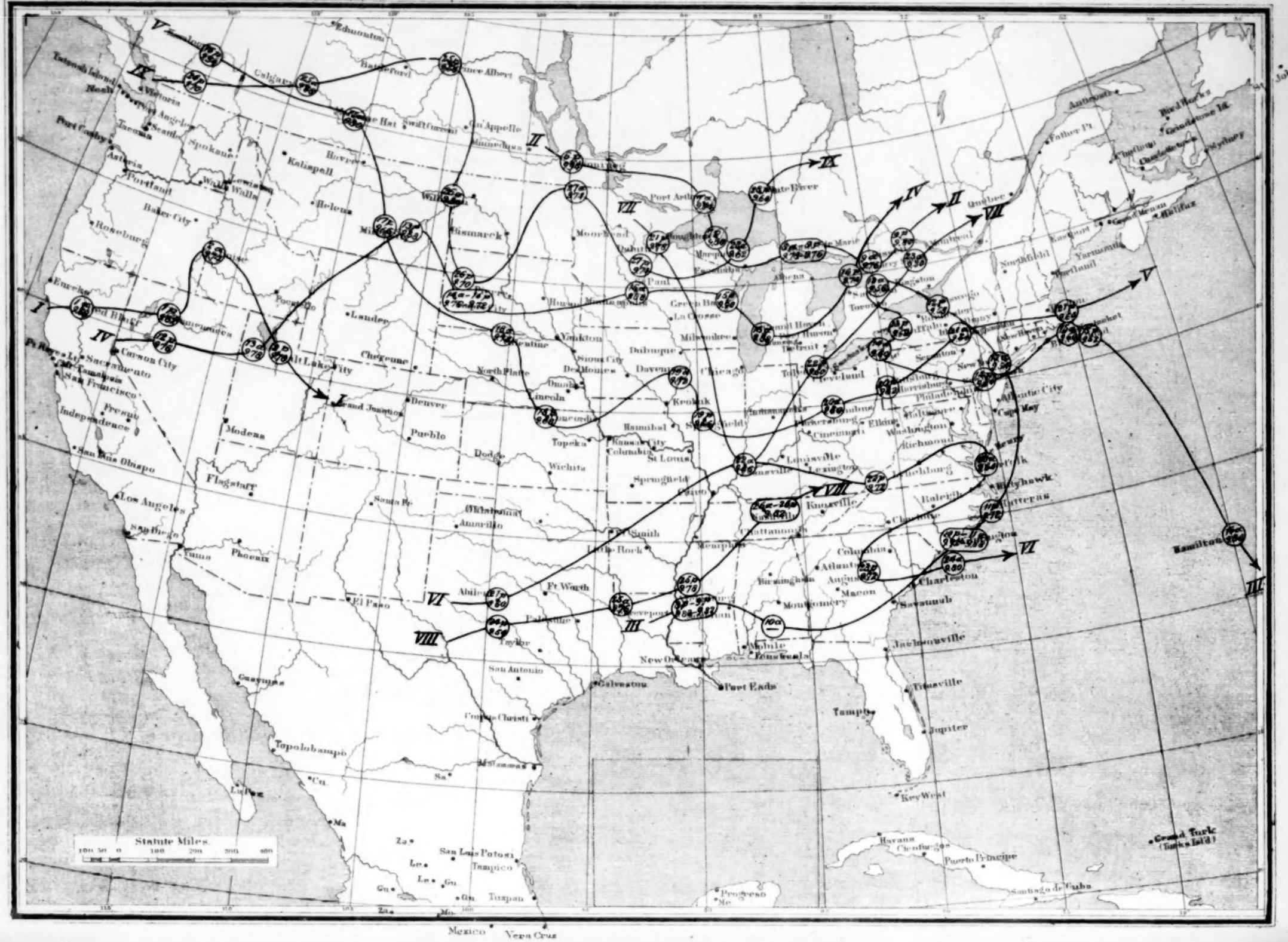
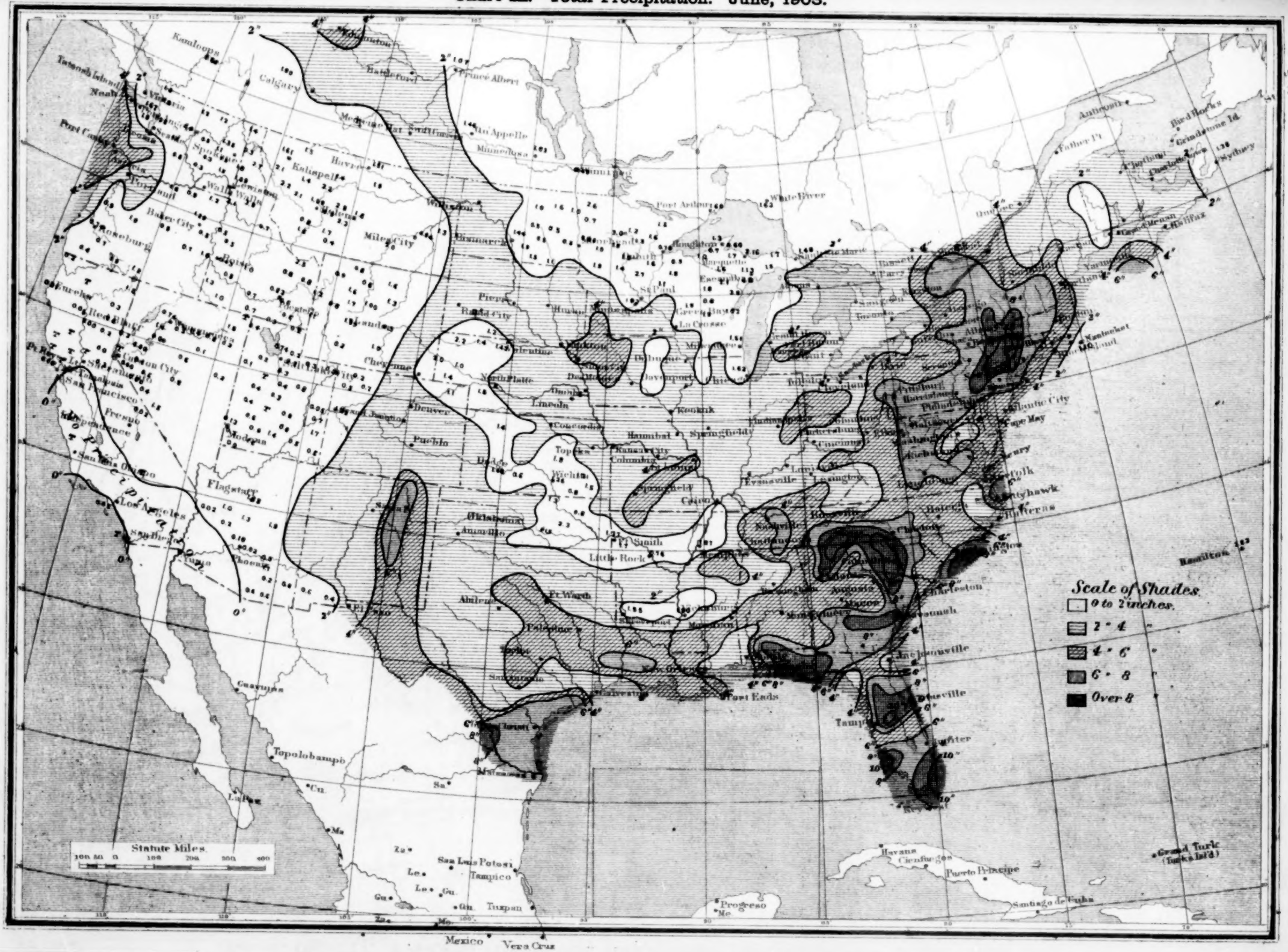


Chart III. Total Precipitation. June, 1903.

• Bakersville

Chart III. Total Precipitation. June, 1903.



• Baskerville **Chart IV. Sea-Level Pressure and Temperature; Resultant Surface Winds. June, 1903.**

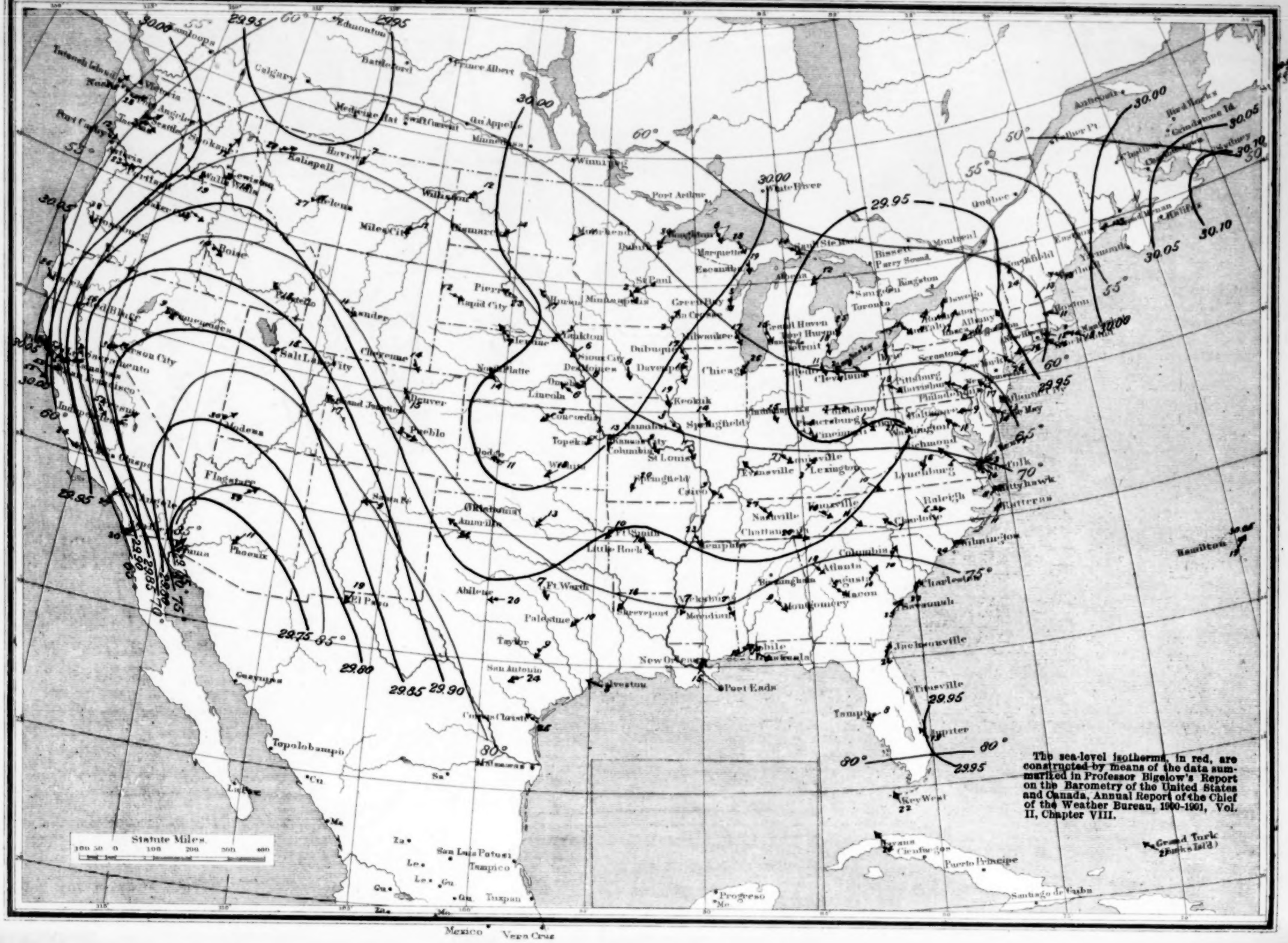
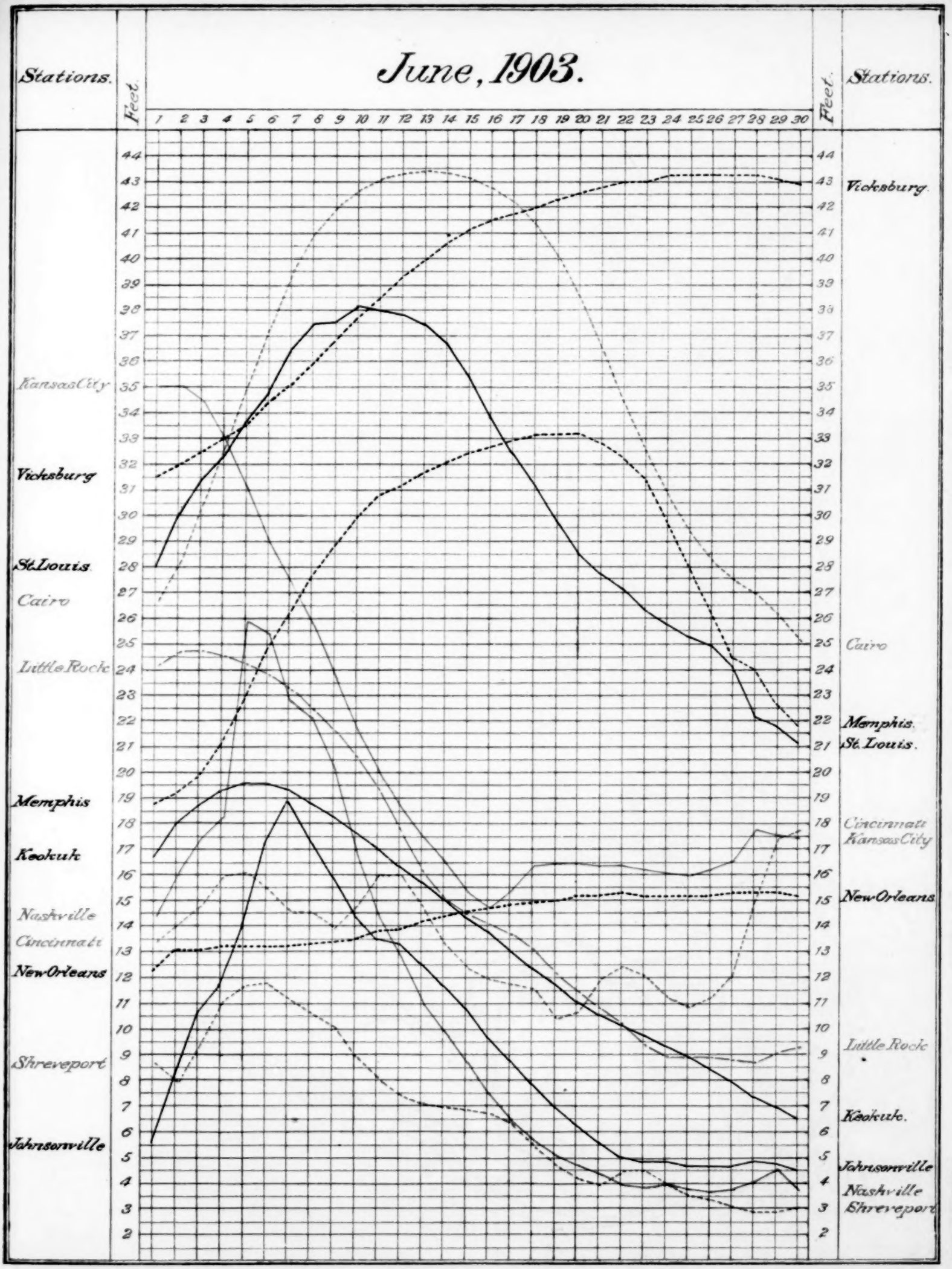

Statute Miles
100 50 0 100 200 300 400
The sea-level isotherms, in red, are constructed by means of the data summarized in Professor Bigelow's Report on the Barometry of the United States and Canada, Annual Report of the Chief of the Weather Bureau, 1900-1901, Vol. II, Chapter VIII.

Chart V. Hydrographs for Seven Principal Rivers of the United States. June, 1903.



• Barkerville **Chart VI. Surface Temperatures; Maximum, Minimum, and Mean. June, 1903.**

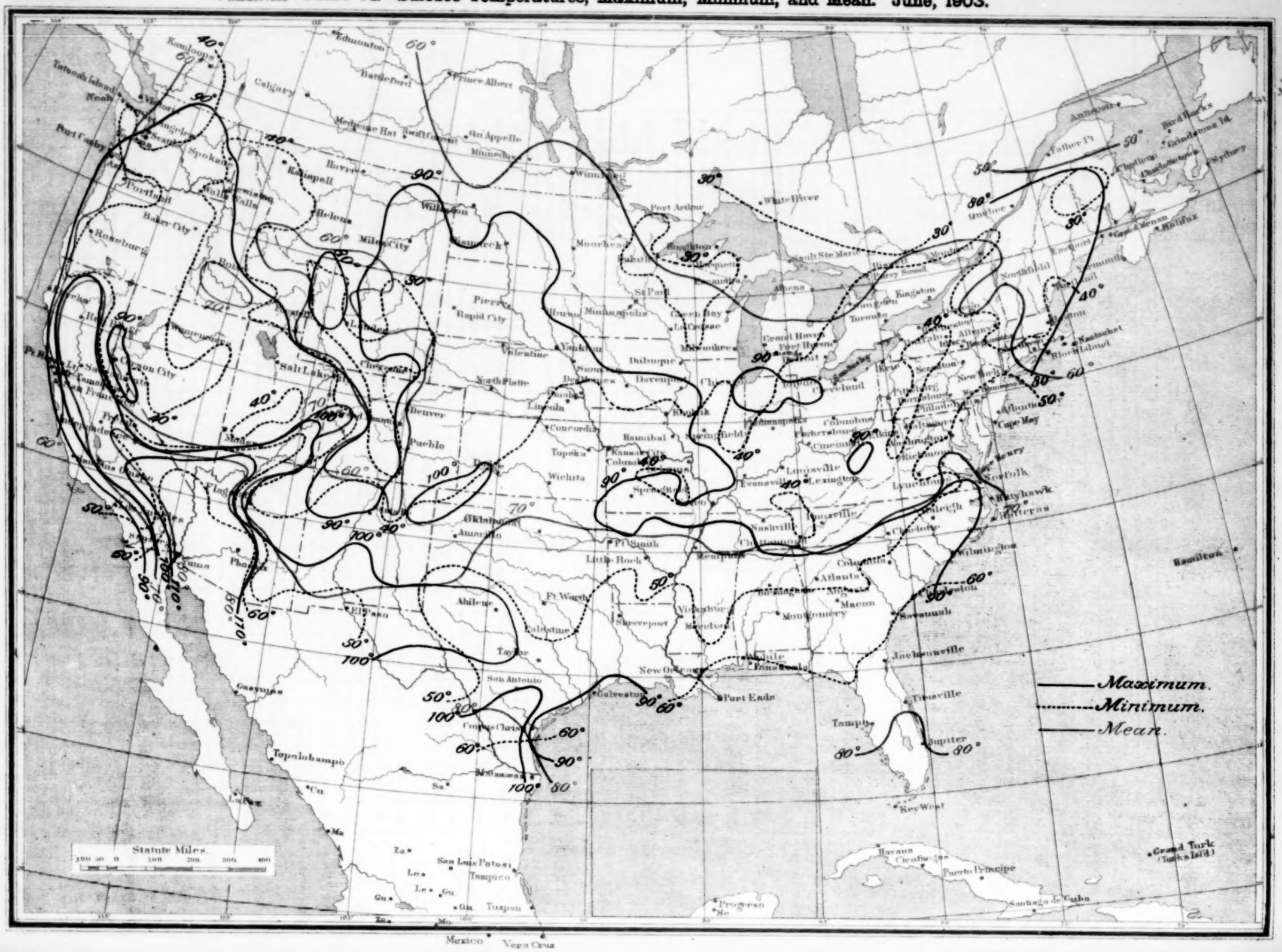


Chart VII. Percentage of Sunshine. June, 1903.

• Barkerville

Chart VII. Percentage of Sunshine. June, 1903.

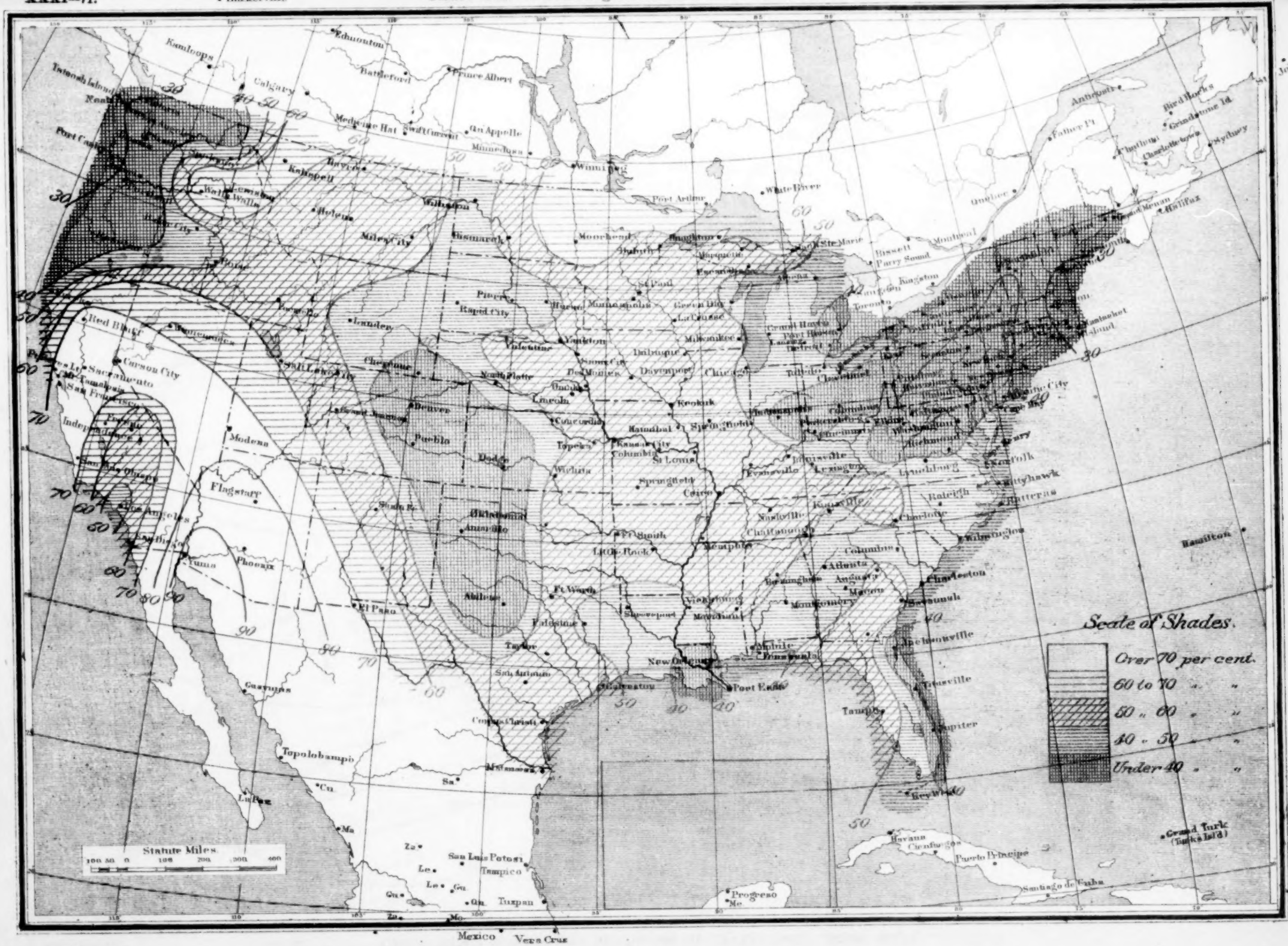


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Chart VIII. Isobars and Isotherms at 10,000 feet. June, 1903.

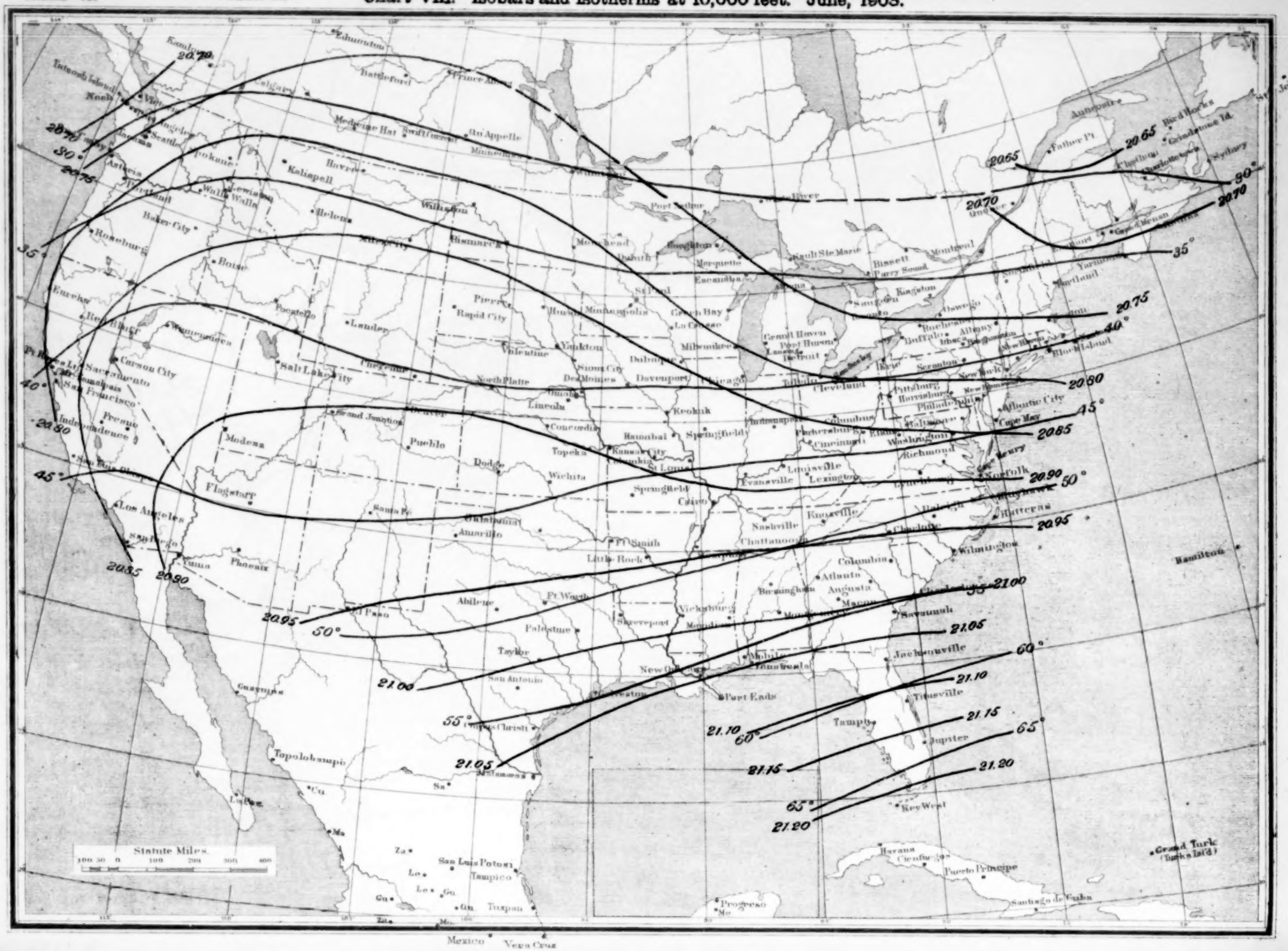

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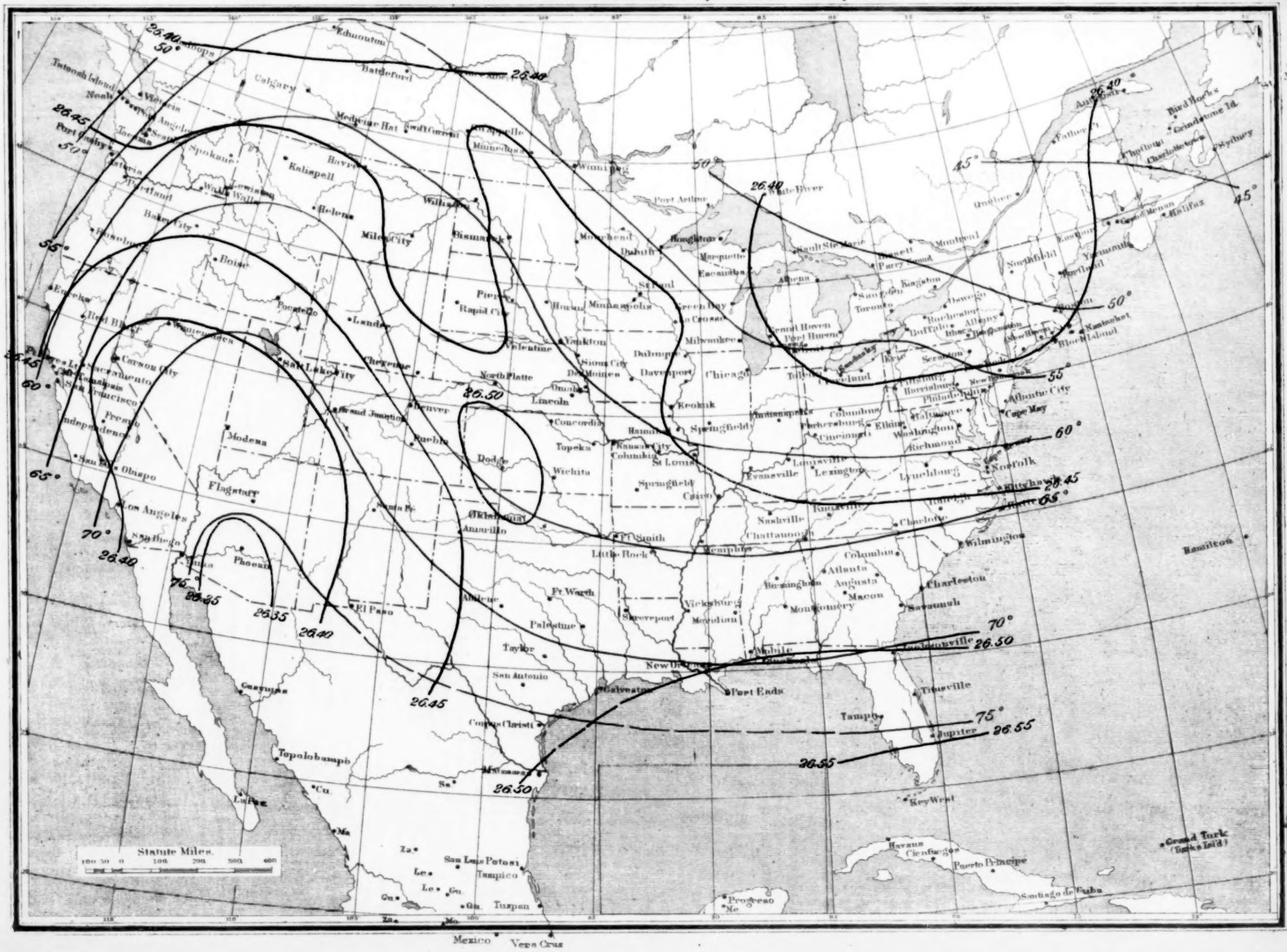
Chart IX. Isobars and Isotherms at 3,500 feet. June, 1903.



Mexico Vera Cruz